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ENDEMIC GOITRE: A PUBLIC HEALTH ANACHRONISM

The iodization of domestic salt as a means of preventing endemic goitre was first recommended by the French scientist J. B. Boussingault as far back as 1831. His advice went almost unheeded, however, and it was not until ninety years later that a large-scale experiment conducted by Marine and Kimball demonstrated the complete efficacy of this measure. Nearly forty years have passed since then and endemic goitre is still prevalent in almost every country of the world. Yet it is recognized today that if iodized salt were introduced everywhere for domestic use, simple goitre would become a disease of the past. Goitre is, in fact, an anachronism.

The failure of many countries to take sufficiently active measures against endemic goitre springs from a number of causes: lack of conviction that iodization of salt would be effective, doubts about the safety of the method, technical difficulties, and, in some cases perhaps, underestimation of the importance of the problem. It is true that endemic goitre is not a "killer" disease; but, even in its milder forms, it is responsible for much human misery and has serious reperoussions on the physical, social and economic well-being of the population. In the hope of stimulating interest in prophylactic measures and of assisting governments in investigating the position in their countries, WHO organized a Study Group on Endemic Goitre in 1952, subsequently publishing its report and a number of individual papers on the subject in its Bulletin (Vol. 9, No. 2). A more comprehensive account of what is at present known about the prevalence, etiology and control of endemic goitre is given in a second collection of papers published in a recent number of the Bulletin (Vol. 18, No. 1-2) and reviewed below. It is hoped that these papers will later be revised and re-issued, together with some supplementary material, in the form of a monograph.

Goitre and drinking-water

In the opening paper, F. C. Kelly and W. W. Snedden present a comprehensive, country-by-country survey of the prevalence and geographical distribution of endemic goitre. The survey covers nearly 120 countries of the Americas, Europe, Africa, Asia, and Oceania, in all of which endemic goitre has been recorded—an impressive testimony to the global nature of the problem. But although goitre is so widely distributed, the prevalence varies from less than 1% in some areas to close on 100% in others. Districts of high and low prevalence may be only a few miles apart; they may even be neighbouring villages. Usually the determining factor can be demonstrated to be the quality of the drinking-water, which, in turn, is largely determined by the type of terrain over which the water flows. The iodine content of the soil is derived from atmospheric iodine, liberated from sea-water by oxidation and carried inland by winds. The iodine is brought down by rain or snow, but the process of building up an iodine-rich soil takes hundreds of thousands of years. The glaciers of the last Ice Age swept away the older iodine-rich soils, and the postglacial soils, generated by the grinding-up of virgin rocks, contained, at the most, one-tenth the average iodine content of mature agricultural soils. The prevalence of goitre in North America and in a number of countries of Europe, Asia and Australasia is closely correlated with the extent of quaternary glaciation and the length of time since the glaciers receded.

It is not only the iodine content of the water that is important, however. Several studies have shown that hard water appears to have an adverse effect on iodine utilization; at least, in areas where the drinking-water is hard, a considerably higher intake of iodine is needed to prevent goitre than is the case where the water is soft. Here again,

of course, it is the composition of the terrain over which the water flows that determines its hardness.

Another quality of the drinking-water that appears to bear a relation to the prevalence of goitre is the degree of pollution. This was already suggested fifty years ago by McCarrison, who noted that in eight Himalayan villages, situated one above the other on the mountain side and served by the same water-supply, the goitre rate increased gradually from 11.8% in the highest village to 45.6% in the lowest. McCarrison showed that suspended matter filtered from the grossly polluted water of the latter village produced goitre in volunteers. Boiling the suspended matter destroyed its goitrogenic action. Moreover, a neighbouring village, which had an independent water-supply of exceptional purity, was free from goitre. It has recently been suggested that the goitrogenic substance is a urochrome derivative which binds copper in the serum.[1]

Goitre and diet

Kelly and Snedden describe a number of instances in which a high goitre rate has been ascribed to the consumption of goitrogenic foodstuffs, especially cabbage, kale, and other vegetables of the *Brassica* genus. In Tasmania, a scheme was introduced in 1949 for issuing potassium iodide tablets to all schoolchildren. Five years later, a survey showed that there had actually been a marked increase in the goitre rates of the children, except in girls over 12 years of age. When the country was partitioned into six districts, it was found that in three of them there had been a fall in prevalence, as expected, whereas in the other three there had been a steep rise, suggesting that here some other factor was operating. It was recalled that one year after the first issue of potassium iodide tablets, the Government introduced a free-milk scheme for schoolchildren. As a result of the increased demand for milk, the farmers had extended their plantings of chou-moellier (marrowstem kale), a crop used for grazing cattle during the winter months. The districts where chou-moellier cultivation increased most were found to correspond exactly with those where there had been a steep rise in goitre prevalence; and milk from chou-moellier-fed cows could be shown to interfere with the uptake of iodine, both in laboratory animals and in humans. It has not yet been possible to isolate the goitrogenic substance from the milk, but it is known that vegetables of the *Brassica* genus do contain anti-thyroid substances of the thiourea group.

Similar explanations have been advanced of experiences in Denmark and in Belgium during the Second World War. In Copenhagen, the incidence of thyrotoxicosis increased slowly from 1938 to 1941, rose sharply in 1942, and reached a peak in 1943-44. It then fell again, so that by 1947 the rate was practically the same as in 1939-40. In Denmark, soya bean, which is known to contain an anti-thyroid factor, is normally used as cattle-feed. It has been postulated that sufficient of this anti-thyroid factor finds its way into the milk to keep down the incidence of thyrotoxicosis. Supplies of soya bean were cut off entirely from 1941 to 1945, so that the rise in thyrotoxicosis at this time might well have been due to the lack of the anti-thyroid factor in the milk.

The wartime experience of Belgium was the reverse of that of Denmark: not only was there no increase in the number of cases of thyrotoxicosis, but the severity of the existing cases decreased. At the same time, there was an increase in the incidence of simple goitre. These two phenomena may have been due to the increased consumption of cabbage and other *Brassica* vegetables during the war in Belgium.

A striking example of how dietary habits and the general way of life may influence the incidence of goitre is provided by the two villages of Lampoe and Tjatoer in Bali, which are situated only a few hundred yards apart. At Lampoe there is not a single case of goitre among the 100 inhabitants. They are Chinese traders who have intermarried with the native Balinese. Their food is varied and they boil their drinking-water.

[1] Hettche, H. O. (1956) *Arch. Hyg. (Berl.)*, **140**, 79

By contrast, goitre is very prevalent in Tjatoer. Its 700 inhabitants, of pure Balinese stock, lead a poverty-stricken existence, subsisting on a monotonous diet of maize and rice, and drinking unboiled water from a goitrogenic spring.

Another interesting case is that of French West Africa, where the 14th parallel forms an almost rigid barrier between the goitrous and the non-goitrous zones. The salt used by the peoples of the latter zone is natural sodium chloride from sea-water or from the rich salt-producing areas of the south Sahara. But the salt trade-routes have never penetrated much below the 14th parallel, and people living south of this line are dependent on " pot-ash " obtained by the incineration of local plants. This vegetable salt is probably deficient in iodine, or may even contain an as yet unidentified goitrogenic agent.

Iodine and the thyroid

Although a number of factors have been incriminated in the production of endemic goitre, the majority of studies carried out with modern methods have provided evidence of iodine deficiency in the diet. Some of these studies, and the relationship between the thyroid and iodine metabolism, are discussed in a paper by J. B. Stanbury.

In areas where endemic goitre does not occur, the mean daily intake of iodine is usually above 75-200 μg, mainly in the form of inorganic iodine. Part of the iodine of the blood is trapped by the thyroid for the manufacture of thyroid hormones. Normally the concentration of iodide in the thyroid is twenty times that in the plasma, but it may be much greater if there is thyroid hyperplasia. The iodine not trapped by the thyroid is excreted by the kidneys, and the daily urinary excretion of iodine serves as a useful index of the quantity of iodine ingested. Surveys have shown that the mean iodine excretion of persons living in endemic goitre regions is much lower than that of persons in other areas. The low ingestion of iodine is also reflected in an increased avidity of the thyroid gland for iodine, as measured by administering radio-active iodine. Studies in western Argentina, the Netherlands and Finland have shown that patients excreting low amounts of iodine in the urine take up abnormally large quantities of radio-active iodine.

When iodide supplements are given to patients with endemic goitre, a slow readjustment of iodine retention takes place until a new state of balance is reached. It seems that at a level of about 5 mg a day the capacity of the gland to absorb iodide from the blood is reached, and if more iodide is given most of it is rapidly excreted.

Trapping of iodide by the thyroid is inhibited by administration of thiocyanate or perchlorate, and it is believed that the goitrogenic substances contained in certain foodstuffs act in a similar way. On the other hand, the uptake of iodide by the thyroid is increased by the action of the thyroid stimulating hormone (TSH) secreted by the anterior lobe of the pituitary gland. The rate of secretion of this hormone depends, in turn, on the concentration of thyroid hormones in the blood: a fall in circulating thyroid hormones causes an increased output of TSH by the pituitary, thus stimulating the thyroid to produce larger quantities of thyroxine and triiodothyronine. This feed-back mechanism for maintaining the correct concentration of thyroid hormones in the blood is, in fact, also the mechanism by which goitre is produced. The process of thyroid enlargement and its sequelae are discussed by F. W. Clements.

Goitres and their sequelae

Although in highly goitrous areas, thyroid enlargement may occur in pre-school children, or may even be present at birth, it is more usual for the available iodine to be sufficient to meet the demands of early childhood. In most areas, the ages at which the highest incidence of goitre occurs are 9-13 in boys and 12-18 in girls—years when the child is undergoing very rapid development and perhaps taking vigorous exercise as well. It is rare for goitre to make its first appearance in adult males, but in women the metabolic stresses of pregnancy and lac-

tation may trigger off the development of goitre, or cause successive, step-wise enlargement of an existing one.

As indicated above, enlargement of the thyroid is brought about by the action of the thyroid-stimulating hormone released by the anterior pituitary gland in response to a low concentration of thyroid hormones in the blood. In the initial, hyperplastic phase of enlargement, the thyroid may return to normal if the iodine-deficiency is remedied or the goitrogen removed. As soon as the gland is large enough to trap sufficient iodide, its structure starts to change by deposition of colloid in the acini. The colloid goitre is the normal resting stage and the condition found in most children with endemic goitre. If additional iodine is given at this stage, the goitre will usually become smaller and firmer but will seldom disappear entirely. If iodide prophylaxis is given to children with goitre, however, the thyroid gland increases little in size compared with the over-all rate of growth, so that there may be no visible evidence of goitre by the time adulthood is reached. Provided that prophylaxis is continued throughout adult life, it is unlikely that there will be any unfavourable sequelae.

If no additional iodide is given, the thyroid goes on enlarging progressively until the age of about 15 to 18 years. In males it may then gradually diminish in size again, but in women, especially those who bear children, goitres usually go through repeated phases of hyperplasia, corresponding with fluctuations in the demand for hormone. During the resting phases, involution leads to the formation of nodules, which are often multiple and scattered irregularly throughout the gland tissue. Large nodular goitres sometimes contain haemorrhagic cysts.

Up till the third or fourth decade of life, colloid or nodular goitres seldom have much adverse effect on health, but later, typical signs and symptoms of myxoedema may slowly develop. A connexion with thyrotoxicosis is less well established. In some parts of the world, notably North America, the British Isles, and parts of continental Europe and Australia, it has been possible to correlate the distribution of thyrotoxicosis with a high incidence of endemic goitre, but there are other highly goitrous areas where toxic goitre appears to be rare or absent. It is possible that these differences reflect differences in the etiology of endemic goitre.

It has also been suggested that endemic goitre predisposes to carcinoma of the thyroid, and there are some data to support this hypothesis. Other workers have failed to find any correlation, however, and it is doubtful whether a definite answer can be given at present. Finally, there is some evidence that endemic goitre can increase the risk of malignant disease in general.

Goitre and cretinism

Clements reviews the present state of knowledge on the subject of cretinism and its possible association with endemic goitre. Attention has often been drawn to the prevalence of cretinism in areas of endemic goitre, and many writers favour a causal relationship. But about one-third of all cretins do not have goitre, and cretinism occurs in persons who have never lived in a goitrous district. Clements distinguishes five types of cretinism: congenital thyroid aplasia; familial congenital goitrous cretinism; acquired athyroidism; acquired hypothyroidism; endemic cretinism.

In *congenital thyroid aplasia*, the child is born without any functioning thyroid tissue and cannot, therefore, have a goitre. Cretinism is very severe. Growth is stunted—adults are seldom more than 3 feet high—and mental development does not take place. Such cretins are deaf-mutes and are incapable of caring for themselves. The condition can be cured by giving thyroid hormone, provided that treatment is started at a sufficiently early age.

Goitrous cretinism may be a familial disease; in one study, four of the subjects were members of one family, and three were cousins of these. The enlarged thyroid of such cretins shows a marked avidity for iodine, but is unable to manufacture any thyroid hormones. Cretinism is usually somewhat less severe that in cases of thyroid aplasia.

Acquired athyroidism and *acquired hypothyroidism* may be secondary to certain infectious diseases, such as measles or whooping cough, and cases have been reported in children whose mothers had taken antithyroid drugs during pregnancy. It seems that the condition can also be caused by the use of cobalt therapy for blood dyscrasia. The degree of cretinism in these cases depends upon the age of onset of the condition and the amount of functioning thyroid tissue remaining.

The etiology of *endemic cretinism* is still a matter of controversy. It is widely held that endemic cretinism is a consequence of endemic goitre, resulting from progressive deterioration and enlargement of the thyroid gland through several generations, but Clements cites a number of objections to this theory. Some regions, such as the Jura and the Andes have had long histories of endemic goitre, yet cretinism is rare. Moreover, many cretins are the children of parents who did not have thyroid enlargement. It has also been noted that cretinism is often concentrated in villages, or even in households; and investigators in Hungary found that the deeper they penetrated into the mountains the more frequent cretinism became. Finally, the prevalence of cretinism seems to bear a direct relationship to the extent of intermarriage. Taken in conjunction with the high familial factor which has been found in studies on sporadic goitrous cretinism, this suggests that endemic cretinism may be an inherited disease, transmitted through a recessive Mendelian factor.

Goitre surveys

From a public health point of view, it is important to have a fairly accurate knowledge of the prevalence of goitre in a population. The classification of goitre and the technique of goitre surveys are discussed in an article by C. Pérez, N. S. Scrimshaw and

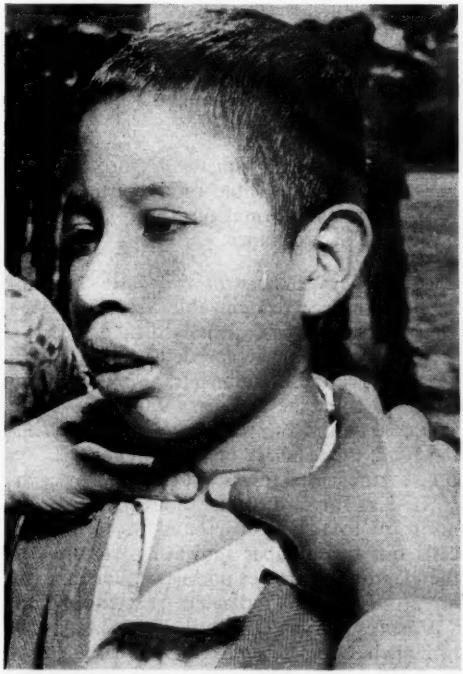


FIG. 1. TECHNIQUE USED IN EXAMINATION OF THYROIDS

Sitting or standing facing the patient, the examiner places his thumbs gently on either side of the thyroid area and determines the size of the gland by palpation.

J. A. Muñoz. Mass surveys are most conveniently carried out on schoolchildren, and since children do not often have large visible goitres, it is necessary to use a palpation technique as well as simple inspection. The usual method of palpation recommended for clinical appraisal is from behind, but for mass surveys, where large numbers of people need to be examined rapidly, it is more convenient for the examiner to stand or sit in front of the subject, so that inspection and palpation can be carried out almost simultaneously (Fig. 1). For practical purposes, a gland estimated to be 4 to 5 times the normal size should be listed as goitrous. Various standards of comparison have been suggested, perhaps the most useful being that the lateral lobes of the thyroid should not be larger than the terminal phalanges of the subject's thumbs.

The authors suggest that the goitres should be classified in the following way (Fig. 2):

Group 0 : persons without goitre.

Group 1 : persons with palpable goitres. The thyroid in these persons is estimated to be more than 4 to 5 times the normal size but is not visible with the head in the normal position.

Group 2 : persons with visible goitres. The goitres are easily visible on inspection with the head in the normal position but are not noticeable at a distance.

Group 3 : persons with very large goitres. The goitres are recognizable at a considerable distance and are grossly disfiguring.

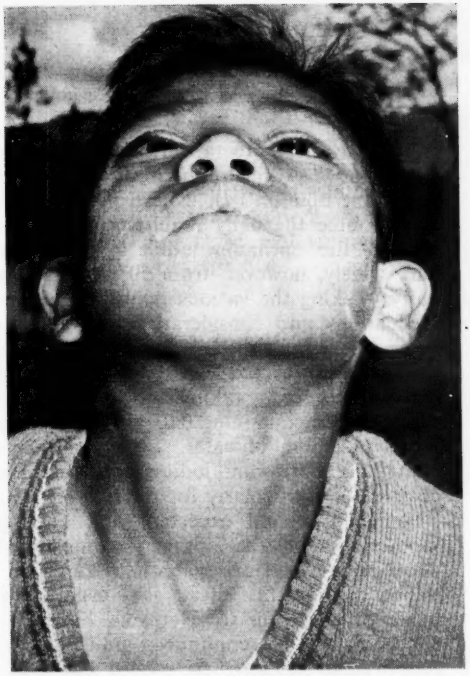
The surveys can be speeded up by the use of small printed or mimeographed forms on which to enter the necessary data relating to the locality and the person examined. With the aid of the teacher, the children can usually prepare their own forms in advance. As each child steps forward to be examined, he hands his form to the recorder and the examiner calls out the number indicating the size of the gland and whether nodules or adenomas are present (this is indicated by encircling an " A " printed on the form). In this way 150 to 200 children per hour can be examined.

For practical purposes, a high degree of accuracy is not necessary in estimating the goitre prevalence. A figure which does not depart from the true value by more than 25% is adequate; but it is important when planning a survey to ensure that the areas included constitute a random sample of the total geographical area. In a densely populated and homogeneous area, it may be sufficient to examine 1% of the population, but in thinly populated districts with a low prevalence it is necessary to examine a considerably larger proportion. The sample should be representative of all the numerically important sections of the population in the age-group studied, both from a geographical and from an occupational point of view. Tabulation of the data obtained in the surveys must proceed in several stages, and the authors suggest three different types of form for this purpose. The first is for the tabulation of data relating to a single locality, the second for combining data by age-groups from several localities, and the third for tabulating data from all age-groups in an area or country. Although, by taking into account the percentage of the population studied, it is possible to calculate from these figures the goitre rate for the whole population, it is recommended that iodization programmes should be based on the prevalence of goitre in children, since the purpose of such programmes is to cater for the current need of iodine.

Goitre therapy and prophylaxis

The first attempts to use iodine for the treatment of goitre were made soon after the discovery of iodine in seaweed in 1811. Unfortunately, the doses employed were so high that iodism and Jod-Basedow (iodine-induced hyperthyroidism) were frequent side-effects, and iodine therapy fell into disrepute. In 1895, Baumann showed that iodine is a normal constituent of the thyroid gland, a discovery which ushered in a revival of interest in the use of iodine for the treatment and prophylaxis of goitre. J. Matovinović and V. Ramalingaswami, in their contribution to the Bulletin, trace these developments

FIG. 2. CLASSIFICATION OF GOITRES



Top right : Group 1 goitre, readily palpable but not visible with head in normal position.

Bottom left : Group 2 goitre, readily visible with head in normal position.

Bottom right : Group 3 goitre, grossly enlarged and recognizable at a considerable distance.

and outline the principles upon which modern treatment and prophylaxis are based.

Treatment. The therapeutic dose of iodine is not known with certainty, but the authors are of the opinion that it need not be more than double the daily requirement. Estimates of the optimum iodine requirements vary widely, however, from 50 μg to 300μg daily. Taking the various published recommendations into consideration, the authors come to the conclusion that the therapeutic dose need not exceed 200 to 300 μg per day. This is provided by taking 4 to 6 drops daily of a solution containing 0.03 g of potassium iodide in 20.0 ml of water. Tablets or sweets containing potassium iodide or iodate are also useful, particularly for the treatment of schoolchildren and expectant and nursing mothers. With the dosage recommended above, side-effects are exceedingly rare.

The therapeutic effect can usually be observed after four to six weeks, but treatment should be continued until general prophylactic measures have been instituted. If no response has occurred after three months, it is probable that the goitre is not due to simple iodine deficiency, and thyroid preparations should be substituted. This applies particularly in cases of sporadic goitre due, for example, to an innate defect in iodine metabolism or to excessive intake of a goitrogenic substance. Thyroid is also indicated for adults with advanced nodular, degenerated or cystic goitres, which often fail to respond to iodine. The dose has to be adjusted to the requirements of the individual patient. It is suggested that treatment should be commenced with 50 mg per day, and the amount gradually increased up to a maximum of 300 mg per day. Patients must be kept under observation during treatment; if symptoms of thyrotoxicosis should appear, treatment must be interrupted for 14 days and then resumed with a 25-50 mg smaller dose. In any case, treatment should be stopped after six months and regular iodine prophylaxis instituted. Some patients relapse despite iodine therapy, and the authors recommend that such patients should be given a short course of thyroid therapy for the first 7-14 days of each month. If hypothyroidism is present, it is necessary to continue giving thyroid as substitution therapy. It may happen that the inhibition of secretion of thyroid-stimulating hormone persists after withdrawal of thyroid treatment (Farquharson's phenomenon), or alternatively that a rebound hypersecretion occurs leading to hyperthyroidism, but such complications are very rare and of temporary duration.

The authors also discuss the indications for thyroidectomy. This operation now carries a mortality of less than 0.2%, and a better knowledge of the anatomy and physiology of the thyroid and parathyroid glands has enabled most of the post-operative complications formerly encountered to be overcome. Certain other forms of treatment to which the authors refer briefly—such as X-ray and radium irradiation—have not given satisfactory results and are not recommended.

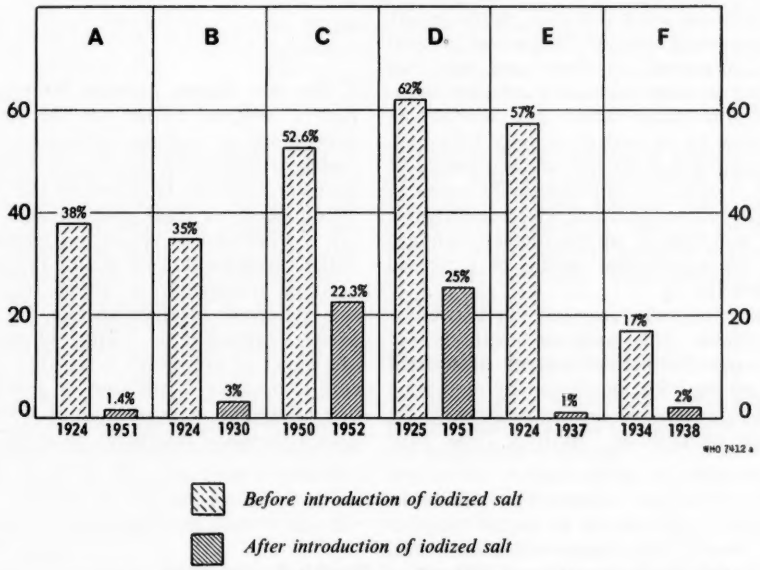
Prophylaxis. The decision to introduce mass prophylaxis is easy to take in areas of high endemicity where many of the adult population have large, nodular goitres, or where there is a significant increase in the incidence of hypo- or hyperthyroidism. In areas where the endemic is mild and goitre is mainly confined to adolescents, however, there is often doubt as to whether the effort and expense of a mass control programme are justified. The authors point out that the so-called " physiological " goitre of adolescents is not a physiological phenomenon—it disappears as soon as iodine prophylaxis is introduced—and that goitrous children tend to be less intelligent than those with normal thyroids. They make the tentative suggestion that general prophylaxis should be undertaken if 10% or more of children between the ages of 7 and 15 have visible enlargement of the thyroid.

As has already been indicated, the fundamental principle of the mass prophylaxis of endemic goitre is the administration of supplementary iodine. Even where goitrogenic factors are present, their effect can usually be counteracted by increasing the iodine intake, providing that the limits of

safety are observed. Nevertheless it may sometimes be possible to reduce the incidence of goitre by other measures, such as changing the supply of drinking-water where this is excessively hard.

Of the various methods that have been tried from time to time for providing supplementary iodine, the iodization of salt has been found the most practicable. It is the least expensive method of providing a continuous supply of iodine, and is both safe and reliable, whatever the dietary habits of the population. Fig. 3 shows some of the remarkable decreases in goitre incidence that have been achieved following the introduction of iodized salt. Methods of iodization of salt are discussed by J. C. M. Holman in the final paper of the series.

FIG. 3. REDUCTION OF GOITRE INCIDENCE: RESULTS OBTAINED BY THE USE OF IODIZED SALT



A. State of Michigan, USA
B. City of Detroit, Mich., USA
C. Norte Caldas, Colombia
D. Christchurch District, New Zealand
E. City of Lausanne, Switzerland
F. Krakow Voivodship, Poland

Iodized salt

The greater part of Holman's article is concerned with details of technical processes, but there are a few points of more general interest. One of these is the choice of iodine compound. Formerly, sodium or potassium iodide was used exclusively, but iodides have the disadvantage that they are unstable in the presence of moisture, and that, owing to their solubility, they are attracted to areas of high moisture content and thus often migrate from the salt to the material of the container. Potassium iodate, on the other hand, is a very stable compound and has a low solubility. It has been shown to be rapidly assimilated, to be effective in the treatment of goitre, and to be well tolerated. It is therefore recommended that potassium iodate should be used whenever the salt is likely to

contain moisture or impurities or to be exposed to adverse climatic conditions. If potassium iodide is used, the salt should be free from impurities, should be reasonably dry and free-running, should be packed in containers with impervious linings, and should be stored in a cool, dark place. A stabilizing agent may also be added. High-grade salt conforming to these requirements is available only in countries with high living standards, and is quite unknown to most inhabitants of the world.

The levels of iodization adopted in different countries vary from 1 part in 10 000 to 1 part in 200 000. In fixing the level, public health authorities must consider the average amount of salt consumed per head per day, the prevailing dietary habits, the possible existence of goitrogenic factors and whether all food salt is to be iodized or only table salt. It is suggested that the level chosen should be such as to ensure a minimum daily intake of 150 μg of iodine, and that where goitrogenic factors are present, or the dietary standard is low, the supplement should be increased up to 300-400 μg.

Both the manufacturer and the distributor need reliable and accurate methods for determining the iodine content of iodized salt. Two methods, developed by modifying the technique devised by von Fellenberg, are described by Holman. Both of these have been accepted by the Association of Official Agricultural Chemists in the USA after satisfying rigorous tests of reproducibility, and it is recommended that they should be adopted in all countries to facilitate direct comparison of results. A very sensitive method has been developed by Rogina and Dubravčić for determining the small amounts of iodine that may be present in normal supplies of salt, in saline deposits and in sea water. This method may be of value when making preliminary surveys of the sources of dietary iodine available to a population.

* * *

The two themes running through all the papers reviewed above are the world-wide importance of endemic goitre as a public health problem and the ease with which the problem could be banished by the universal introduction of mass prophylaxis. Because salt is a convenient vehicle for administering iodine supplements and because the quantities of iodine required are so minute, the solution is a relatively inexpensive one. In fact, as Marine expressed it: "The old adage that one ounce of prevention is worth a pound of cure is outdone in the case of goitre, where one milligram of prevention is worth more than a thousand milligrams of cure."

Index to International Digest of Health Legislation

In view of the scope and variety of the material published in the *International Digest of Health Legislation*, and in order to facilitate reference and research, it has been decided to issue cumulative indexes to this publication from time to time. The first of these indexes—which consolidates and amplifies the indexes to the first five volumes of the Digest, covering the period 1948-1954—has just been published. The price of the index, which is available in English and French, is 3/6, $0.70, or Sw.fr. 2.

THE FUTURE OF THE MENTAL HOSPITAL

The mental hospitals of the past were overcrowded, prison-like buildings, where patients were forcibly detained in an unreal, artificial world with little hope of cure. The emphasis has now shifted to rapid cure and rehabilitation, with the majority of patients being treated outside the hospital. The psychiatric hospital of the future may be pictured as the headquarters and the training and research centre of the local mental health organization, with only a small residential unit for special treatment and investigation. In an article shortly to be published in the WHO Bulletin, Dr Geoffrey Tooth, Medical Officer of the Ministry of Health (England and Wales) and WHO Consultant, suggests how these concepts might be applied when designing and building up a modern mental health service under various conditions. His principal arguments and conclusions are summarized below.

A revolution is at present taking place in the treatment of mental disease and the design of mental hospitals. Only fifteen years ago, more than half the patients in the average mental hospital in England and Wales were detained there against their will, cut off from the outside world, except for occasional visits from relatives and friends. They could expect to remain there for at least six months, and the majority were destined to spend the rest of their lives in this seclusion. In fact, they were treated more like prisoners than patients, and the hospitals were often built on the same lines as prisons. In many parts of the world, even today, no distinction is made between mental disease and criminality.

All this is changing, however. Hospital bars are being removed, doors opened, and patients encouraged to come voluntarily for treatment, as they would to any other hospital. Hand in hand with recent advances in treatment, hospital staffs are adopting a much more positive attitude to mental disease. Patients who would have been regarded as incurable a few years ago are being discharged, and the average stay of patients recovering within one year is now only about two months. Special short-stay units are being constructed for these patients away from the main hospital, and the number of admissions is being kept to a minimum by treating as many patients as possible in out-patient clinics, often attached to general hospitals. Other patients are receiving domiciliary treatment, and old people are being cared for in the geriatric departments of general hospitals. Overcrowding is thus disappearing.

Planning a mental health service

These are the broad lines along which the mental health services in England and Wales are at present evolving. But to attempt to impose this pattern rigidly on other countries with different traditions and cultures and at different stages of development might well lead to disappointment and failure.

The first essential of a plan for a mental health service is that it should be realistic. Three groups have to be convinced not only that the scheme is workable, but also that it will benefit them personally: the medical and nursing staff of the existing psychiatric service, the government administrators, and the public. The initial appeal must be to the doctors, because without their support the scheme can never get started. As the doctors and their staff generally claim to be overworked, they must be convinced that their work will be made easier by adoption of the plan. Administrators are more likely to approve a plan that is either already in

operation or can be started without involving them in any great financial outlay or political responsibility. Finally, the plan should be self-advertising and flexible, and should be so framed that once the first step has been taken a public demand is created for the next.

The starting point

If the first step is going to ease the work of doctors and nurses, it must be directed against overcrowding of the hospital. Gross overcrowding is, after all, probably the most serious obstacle to mental hospital reform, because it makes individual attention impossible and regimentation inevitable. Experience in England and Wales has shown that enlarging and modernizing a hospital does not, of itself, relieve overcrowding. But it has been found that very many of the patients formerly admitted to hospital can be treated successfully in out-patient clinics. Furthermore, doctors welcome the chance that out-patient work provides to get away from the hospital for a time; and administrators can be safely assured that out-patient clinics are easy to set up and cheap to run. Out-patient treatment is thus a convenient starting point for the reform of a mental health service. It is, naturally, much more acceptable to the patient and his relatives than admission to hospital, so that the provision of one clinic soon leads to a demand for others. Indeed, it is no exaggeration to say that the prestige of a modern mental hospital depends largely on the results of its out-patient care.

It is suggested that the out-patient department should be equipped to give electric convulsive therapy from the start; properly given, this is a safe form of treatment which can be extremely useful in reducing the number of admissions to hospital. An important function of the clinic is to obtain a history of the patient and his family, and a picture of his present social environment. Although this is best done by the psychiatric social worker, it is possible for sufficient information to be elicited by a nurse or other untrained worker, using a simple questionnaire. At the same time, the doctor in the clinic should make contact with other social organizations; by a personal approach he can obtain much background information that will enable him to help his patients. In return, he will find himself swamped with requests for advice—but this is a healthy way for a preventive service to start. The out-patient clinic is also useful for establishing closer links with general medicine, particularly as it is most conveniently placed in a general hospital.

Modernizing the hospital

The ideal site for a mental hospital is near the centre of the community it is to serve. Not all hospitals are so sited, and most of them are of old-fashioned design. But the building of a new mental hospital is a rare event, so that in general the best must be made of existing buildings. The prison-like atmosphere can be toned down considerably by the removal of bars and the use of paint and whitewash. Once overcrowding has been relieved by opening up out-patient clinics and, if possible, by using the geriatric and domiciliary services in general hospitals, there are other reforms that can be introduced. First, a section of the hospital should be set aside and converted into a modern treatment unit for short-stay patients. If a separate building is not available, a ward or part of a ward in the main block could be used, but it should have a separate entrance so that its occupants have no contact with the rest of the hospital population. It is important that the unit should be adequately staffed from the start, even at the expense of the rest of the hospital. Reliable patients can often assist in nursing to relieve staff shortages.

The short-stay unit will be the shop window of the new mental health service, and a high standard of comfort and efficiency should be aimed at. The decoration and equipment should make a complete break with those of the traditional mental hospital. Beds should be provided, even in countries where patients are accustomed to sleeping on mats on the floor, because they made modern treatment and nursing safer and

easier. For a unit attached to a hospital of originally 1000 beds, twenty beds for each sex should be sufficient, if possible with room for expansion to forty without overcrowding. The success of the unit will depend largely on the efficient screening of patients before admission, and, except in emergencies, no patient should be admitted to it without having been thoroughly examined in an out-patient clinic. At the same time, care must be taken that it does not degenerate into an admission unit to which all patients are first sent before admission to the main hospital, though in exceptional cases patients who cannot be discharged in a reasonable time—say six months—will have to be transferred to the main wards.

In recent years, much has been made of the " open door " policy, but the unlocking of doors is not so much an end in itself as the inevitable result of the lessening of overcrowding and a better atmosphere in the hospital. Although there has been opposition from the nursing staff in some places, it usually happens that once one ward is opened, the staff soon request the opening of others because they find it makes their work easier. It is a mistake, however, to open doors until the incentive to go out has been provided. In the traditional mental hospital, with its emphasis on the custody and segregation of the patient, it was necessary to provide a miniature township, with elaborate facilities for occupation and recreation, within the hospital itself. In a properly sited hospital, this is no longer necessary or desirable. The usual varieties of indoor handicrafts should be available, but as soon as the patient is well enough he must be encouraged to go outside and find the same type of amusement as the general public. In this way, the patients do not have a chance to become dependent on organized recreation, and the fact that they are forced to keep in touch with the public during the early stages of convalescence is all to the good.

For the long-stay patient, of course, some form of occupation must be provided. To be of real therapeutic value, this should be work in which the patient can take an interest and which will give him a sense of achievement. The dangers of allowing patients to redecorate and modernize their own wards have been much exaggerated and are outweighed by the benefits both to patients and staff. In some hospitals, the patients have even erected new buildings made of concrete blocks; and, in times of full employment, neighbouring industrial firms often welcome the additional labour that a mental hospital can provide.

The self-respect and self-reliance of the patient can be further encouraged in a number of ways. Important among these is the practice of allowing every patient to have his own, marked clothing. The beneficial results of this measure well repay the additional work involved. Patients should also be provided with a certain amount of pocket money which thay can spend as they choose. Opportunities for contact with the opposite sex give patients a new interest in their appearance and an incentive to improve their manners. Meals should be taken in a common dining-room, and mixed hostels for old people are becoming increasingly popular. The use of women doctors for men's wards, and *vice versa*, is already a common practice.

Collaboration with other services

If a mental health service is to run efficiently, it is not sufficient merely to provide adequate facilities for the care and treatment of patients in the hospital and in out-patient clinics. There must also be a close liaison between the staff of the mental hospital and the mental health section of the local authority. In particular, the social workers of the two services should work together, if possible in collaboration with other voluntary and State-sponsored services interested in mental health and the welfare of discharged patients. In one town in England, what is virtually a domiciliary service has evolved, in which the social workers carry out the treatment prescribed by the psychiatrists. In this way, admissions to hospital have been greatly reduced in proportion to the number of persons seen and treated. A system of this kind also enables the hospital psychiatrists to play

a part in the social field outside, with benefit both to the community and to the doctors themselves.

Some of the most successful psychiatric treatment is given by the family doctor, and the development of psychiatry in general practice is now being studied in England and Wales by organizations representing the general practitioners and psychiatrists. Close association with the general hospitals is also important. It is now generally accepted that every out-patient department of a general hospital should include a psychiatric section staffed by doctors from the local mental hospital; and an increasing number of general hospitals are making beds available for psychiatric patients who need in-patient care, but not necessarily in a mental hospital.

Alternatives

In some areas the prerequisites for setting up a mental health service along the above lines do not exist. There may be no mental hospital at all, or the hospital may be so bad that the only proper course is to close it. In such circumstances, the first thing to do is to establish a headquarters from which a mobile team can operate. Preferably this should be a building attached to a general hospital. A store-room, a classroom for training staff, and a record office are all that are needed at first, so that a very simple structure will do. Later, it can be expanded to include a diagnostic centre where special investigations can be made.

In some countries, it is customary to care for the mentally sick in their own homes. It is advisable to preserve such a tradition where it is already established, with the mobile teams responsible for prescribing and supervising treatment. In other cases, a treatment centre can be set up, consisting of a number of very simple buildings in which the patients and their families can live. The adjacent headquarters then serves as a base for the treatment of out-patients as well as of residents. Non-medical staff should be recruited locally, and since their duties will be almost entirely custodial they can be untrained, even illiterate. In fact, illiteracy is sometimes an asset as unsophisticated patients may mistrust a literate person. One of the main advantages of this system is that it enables patients to be treated in their home environment and the relatives not only see what is going on but also help with the nursing. In many countries outside Europe—for example in Africa—patients from rural areas pose a major problem in large, urban hospitals, as they speak different languages, have different cultures and customs, and sometimes even eat different food.

For the incurable, socially unacceptable patient, who cannot be admitted to these treatment centres, other arrangements must be made. But the hope of recovery should never be abandoned, nor should the patient be allowed to sink into a state of social dilapidation. Long-term care should be so organized that those who must accept it are still able to feel that they are of use. Employment of some sort should therefore be provided, and opportunities for contact with friends and relatives should also be readily available. The central, custodial type of hospital is obviously undesirable, but there are other possibilities, of which the " working village " is a good example. In any case, the units should be kept small. They can be managed by a layman, but the psychiatrists in charge of the mobile team should pay regular visits and act as advisers.

Criminal lunatics

There is one type of patient who does not fit into any of the schemes outlined above—the mentally disordered criminal. The suggestion is sometimes made that criminal lunatics should be treated in the company of and under the same conditions as other mental patients. This, however, throws an unjustifiable strain on the nursing staff and is likely to result in a reversion to the policy of custodial care for all. Such patients are relatively few in number and there is much to be said for bringing them together under one roof. Public opinion demands that criminal lunatics should be kept in strict custody, and it is undesirable that this type of care should become associated with that of mental patients in general.

In conclusion, it seems likely that the mental hospital of the future will be defined by function more than structure. Its curative sections, consisting of short- and medium-stay units, could be in or near the general hospital where most of the out-patient work is already done. The community services for prevention, screening, and after-care depend for their success on co-operation between the local authority and the hospital staffs; so long as they work closely together, the headquarters might be in the town hall, the hospital, or wherever else is most convenient.

DIARRHOEAL DISEASE WITH SPECIAL REFERENCE TO THE AMERICAS

In several countries of the Americas diarrhoeal disease is the principal cause of death, and in almost all of them it is one of the most important causes of morbidity and mortality in infancy and early childhood. Its prevention is therefore a special concern of the Pan American Sanitary Bureau (PASB), WHO Regional Office for the Americas, which recently sponsored regional seminars on diarrhoeas in children in Santiago, Chile, and in Tehuacán, Mexico. The text that follows is the summary of a paper [1] prepared by Dr Louis H. Verhoestraete and Dr Ruth R. Puffer on the basis of working documents which they presented at these two seminars.

Analysis of the five principal causes of death in infancy (i.e., at less than 1 year old) in ten selected American countries [2] shows that, in all of them except Canada and the United States, the mortality rate from diarrhoea for this age-group is 700 or more per 100 000 live births. For six of these countries, diarrhoeal disease is the principal cause of death in early childhood (1-4 years). In the four remaining countries (Argentina, Canada, the United States and Uruguay) the rates are much lower; nevertheless those for Argentina and Uruguay are 7-10 times those for the United States.

The situation varies considerably from country to country, but in general mortality from diarrhoea is higher in infancy than in early childhood. To a great extent the deaths from all causes in these age-groups are a reflection of diarrhoeal-disease mortality.

The frequency with which the infectious agents responsible for diarrhoeal disease are found varies according to population group, age, locality, climate and season, to the survey methods used, and also to the interval between the onset of illness and the time of the investigation. Hospital investigations in the past had established enterobacteria of the *Salmonella* and *Shigella* genera as the chief etiological agents of diarrhoea, but evidence is accumulating of a direct causal relationship between enteropathogenic *Escherichia coli* and the disease. From studies of the role of viruses in gastro-enteritis—a factor only recently taken into account—it now seems possible that a certain number of diarrhoea cases which gave negative results with the older, less developed techniques could have been caused either by *E. coli* or by viruses.

Between 1952 and 1954, Thomas and Charter [3] investigated the frequency with which *E. coli*, *Proteus*, *Shigella* and *Salmonella* occurred in cases of enteritis among children under 4 years old living at home in Edmonton, England, an area where incidence

[1] This paper was published in Spanish in *Bol. Ofic. sanit. panamer.*, 1958, **44**, 95, and has just appeared in English in *Bull. Wld Hlth Org.*, **19**, 23.

[2] Argentina, Brazil, Canada, Chile, Colombia, Guatemala, Mexico, the United States, Uruguay and Venezuela

[3] Thomas, M. E. M. & Charter, R. E. (1956) *Brit. med. J.*, 2, 339

of the disease was low. *E. coli* was found in 13.1% of the infants, but in only 1.6% of the 3-year-old children; the findings for *Proteus* were similar. On the other hand, the frequency of *Shigella* was relatively low for infants (6.2%), increasing to 21.3% for 3-year-olds, while *Salmonella* was found in only 2.7-3.7% of the children examined. Similar investigations are now being made in Pernambuco, Brazil, in areas where incidence is high, by the Brazilian Special Service of Public Health, and studies on the subject have been carried out in the Hospital Infantil, Mexico.[4]

Studies on the prevalence of *Shigella* and *Salmonella* have been made in selected areas of California and Texas (USA), Egypt and Guatemala where death rates from diarrhoeal disease were high. In every instance, *Shigella* was found more frequently than *Salmonella*, its prevalence being lowest among infants under 1 year and highest among children 1 year old. The lower prevalence and incidence of *Shigella* infection in infants raise interesting questions concerning the fundamental mechanism of transmission of the disease.

Data on mortality trends in the United States over a period of 20 years, during which the quality of water-supplies was improved, show that this improvement definitely contributed to a decline in mortality from typhoid fever, but that its influence on the death rate from diarrhoeal disease was less marked. However, an abundant supply of water in or near the home, by encouraging a higher level of personal cleanliness, undoubtedly helps to interrupt the transmission of hand-carried *Shigella* infection, as was shown in recent investigations in the United States.

The control of flies is an essential part of any programme to reduce the spread of *Shigella* infection. Not only should the use of insecticides for this purpose continue, but further studies on insecticide resistance should be encouraged, together with a systematic investigation of the reasons for the increase in fly-breeding.

Animals are known to play an important role in the transmission of *Salmonella* infection. This has special implications, particularly in certain rural areas of Latin America where animals and humans often live in close association. No great effort would be needed to keep animals out of dwelling-houses, thereby substantially reducing the risk of contamination.

For a long time information on protein malnutrition was scanty, and physicians were not in a position to diagnose it and certify it as a cause of death. However, recent data on the seasonal distribution of protein-deficiency morbidity and mortality in Guatemala and El Salvador (in particular, the infantile multi-deficiency syndrome known as "kwashiorkor") seem to suggest that there may be a relationship between protein deficiency and diarrhoeal disease. This is a complex subject which requires further study.

In all countries with low standards of living and hygiene, special attention should be paid to the feeding of infants. There is no doubt that, in such countries, breast-feeding offers much greater protection against diarrhoeal disease than artificial feeding. A survey made by Woodbury[5] in the United States, at a time when that country's infant mortality rate was high, showed that deaths from all causes and from gastro-intestinal diseases were far more frequent among artificially fed than among breast-fed infants. The chances of infection increase in most areas from the age of 5-6 months. Even in primitive rural conditions, however, mothers can be taught to make the child's diet safer by early protein supplementation, thus helping to lower the incidence of diarrhoeal disease. In the countries referred to, the reduction of deaths from this cause will ultimately have to be achieved by the prevention of malnutrition and of contamination through feeding, and by the application of specific measures for early oral rehydration.

[4] See *Bol. méd. Hosp. infant. (Méx.)* 1957, **14**, 263.

[5] Woodbury, R. M. (1925) *Causal factors in infant mortality* (US Department of Labor Publication No. 142), Washington, D.C.

TEACHING OF PAEDIATRICS IN LATIN AMERICA

Results of a Survey

The twofold nature of the physician's task—preventive and curative—is perhaps more marked in paediatrics than in any other branch of medicine. Health authorities and professors of medicine in Latin America have long been aware that the improvement of training in paediatrics is a prerequisite for any reorganization of the maternal and child health services. In 1956, as a first step in this direction, the Pan American Sanitary Bureau (WHO Regional Office for the Americas) undertook a survey of the teaching of paediatrics in Latin America and the Caribbean area. The methods used in this survey, together with its findings, are summarized below.[1]

Survey preliminaries and methods

The aim of the survey was to obtain a clear picture of the paediatric education provided in Latin America, to see where improvement was needed, to help the medical schools evaluate their curricula, and to bring paediatric education closer to the community.

When the survey was begun in 1956, professors of paediatrics throughout Latin America were asked for details on the size of their classes, the time devoted to the subject, the range of instruction, the number of beds available in hospitals for practical work, the size and composition of the teaching staff, and the extent of co-ordination with general public health services for children. Data were obtained from 79 medical schools, in 69 of which paediatrics was taught, the total number of paediatric chairs being 74.[2] Visits were paid to a number of schools in order to verify and add to the data already obtained from the professors.

During these visits, library services, lecture halls, laboratories and teaching material and installations were inspected, and chiefs of departments were interviewed to obtain exact information on the precise type and scope of teaching programmes.

In addition, visits were paid to paediatric hospitals, paediatric wards in general hospitals, maternity wards, private clinics, child health centres and similar establishments in which students do practical work. Details were obtained on the types and numbers of cases studied, the equipment, the real extent of participation by students, the methods and procedures employed, the number of professors in relation to students, and the quality of the registers and clinical charts.

Analysis of the situation

On the basis of the data received, an analysis was made of five particular aspects of the teaching of paediatrics: (1) distribution of schools and students; (2) time devoted to the subject; (3) available teaching facilities; (4) paediatric faculties; (5) other teaching activities.

Distribution of schools and students

These factors, like the others, varied considerably from country to country. In Brazil there were 23 schools of medicine; in Mexico, 17; in two countries, 7; in four countries, 3; and in 11 countries, one. In Jamaica there was a school serving all the British colonies of the Caribbean area, and in Surinam a Dutch-language school. The only Latin American country without any school of medicine was Costa Rica. Ten schools of medicine were without any chair

[1] Summary of a paper by M. E. Wegman, J. G. Hughes & R. R. Puffer, published in Spanish in *Bol. Ofic. sanit. panamer.*, 1958, 44, 281. It will also appear in English as a special supplement to *Pediatrics* in July 1958.

[2] The definition of the term " chair " (" *cátedra* ") varies from one country to another; in some it represents a single course, and in others an entire department.

TABLE 1. NUMBER OF SCHOOLS OF MEDICINE AND PAEDIATRIC STUDENTS PER 100 000 INHABITANTS IN LATIN AMERICAN COUNTRIES AND TERRITORIES, 1956

Country or territory	Schools of medicine	Paediatric instruction		Number of paediatric students	Population	Paediatric students per 100 000 inhabitants
		yes	no			
Argentina	7	6	1	1 563	19 470 000	8.0
Bolivia	3	3		66	3 235 000	2.0
Brazil	23	17	6	1 448	59 846 000	2.4
Colombia	7	6	1	425	12 939 000	3.3
Cuba	1	1		250	6 000 000 *	4.2
Chile	3	3		191	6 941 000	2.8
Dominican Republic	1	1		109	2 463 000	4.4
Ecuador	3	3		129	3 777 000	3.4
El Salvador	1	1		25	2 269 000	1.1
Guatemala	1	1		45	3 358 000 *	1.3
Haiti	1	1		35	3 345 000 *	1.0
Honduras	1	1		20	1 711 000	1.2
Mexico	17	15	2	1 249	30 538 000	4.1
Nicaragua	1	1		39	1 287 000 *	3.0
Panama	1	1		12	934 000	1.3
Paraguay	1	1		80	1 601 000	5.0
Peru	1	1		507	9 651 000	5.3
Uruguay	1	1		140	2 651 000 *	5.3
Venezuela	3	3		185	5 949 000	3.1
Jamaica	1	1		23	a 3 562 000 *	0.6
Surinam	1	1		32	220 000 *	14.5
Total	79	69	10	6 573	181 747 000	3.6

* Estimated population
a Population of British colonies in the Caribbean

in paediatrics (see Table 1). Paediatric students in the remaining 69 schools (in 19 Latin American countries, plus Jamaica and Surinam) numbered 6573. Among the 182 million people covered by the survey, the proportion of paediatric students worked out at 3.6 per 100 000. The paediatric student/population ratio ranged from 8.0 per 100 000 to 0.6 per 100 000. In five countries and in the British colonies in the Caribbean the proportion was about 1 per 100 000 inhabitants, whereas in Argentina—which had the highest ratio of all—it was 8 per 100 000. (The ratio for Surinam (see Table 1) has not been taken into account since it is atypical and unlikely to be maintained in succeeding years.)

The number of students studying the subject in the various schools ranged from a maximum of 720 to a minimum of 6, the first quartile being 22, the median 46 and the third quartile 109. Seven schools (10% of the total) accounted for 47% of students covered by the study. Some idea of the uneven

distribution of paediatric students may be gathered from the fact that something over 87% of all such students were entered with 34 schools, whereas only 12.7% were attending the remaining 35 schools, none of which had more than 50 of these students.

The serious shortage of physicians in Latin America has led an increasing number of students to choose what is, in general, a career offering a certain security. Moreover, the authorities insist that the schools should make room for as many students as possible—which often means far more than their facilities warrant. In fact, in many schools less than 50% of the students admitted graduate, and, although the numbers have thinned out by the final year, the size of the classes makes sound instruction impossible.

It would be preferable to improve basic education and create new schools of medicine in those areas where more physicians are needed; in this way, it would be possible to select an adequate number of candidates likely, with appropriate training, to make competent physicians. The same applies to the field of paediatrics.

It was noted that there was a very definite problem in the small schools—one quarter of the schools had 22 paediatric students, or less—since, on account of the high cost per student, there was great difficulty in finding the necessary funds for complete and well-organized courses in paediatrics.

Time devoted to the subject

The hours devoted to the teaching of paediatrics varied from 72 to 468, the first quartile being 150, the median 225 and the third quartile 330. Although it is not easy to establish a minimum number of hours, it is obvious that most of the schools were giving too little time to a subject which takes up at least one-third of the general practitioner's working hours. The Study Group on Paediatric Education convened by WHO in 1956 suggested 300 hours as a minimum and expressed the view that " for adequate coverage more hours were necessary and the allocation of one quarter of the clinical time to paediatrics was envisaged as a reasonable proportion ".[3] Of the chairs surveyed, 65% did not allot this minimum time to the subject. Those devoting more time to it followed present-day educational tendencies by stressing practical work, whereas elsewhere paediatric instruction mainly took the form of academic and clinical lectures to large groups.

Sixteen chairs (more than 20%) did not provide for any individual work with patients in hospitals or out-patient clinics; 11 others had facilities for practical work in the hospitals only. This means that for almost 40% of the paediatric departments or courses there were no facilities for individual work with out-patients—an essential part of paediatric education since it is one of the best ways of learning about child growth and development and about the common problems that arise in practice. In this connexion, the WHO Study Group on Paediatric Education agreed that " the drama of the acutely ill child in the hospital provides fundamental teaching experience, but on the other hand the day-to-day problems in the out-patient department are fundamental too, because they are typical of what the practitioner will encounter in his later career. It was noted that heads of departments are often reluctant to spend much time on out-patient teaching, yet an experienced teacher may make out-patient problems as stimulating and exciting as ward visits. In the out-patient department the student again should work as a physician but here also he must be carefully checked by an experienced doctor who can thus demonstrate how to deal with children and their parents. Properly handled, this is guided independence." [4]

Of the chairs devoting less than 300 hours to the teaching of paediatrics, 13 (about 50%) made no provision for practical work; the instruction they gave was thus found to be inadequate.

Information was available from 47 chairs on the proportion of time spent on paediatric instruction in relation to that taken up by the medical curriculum as a whole. For

[3] *Wld Hlth Org. techn. Rep. Ser.*, 1957, 119, 6

[4] *Wld Hlth Org. techn. Rep. Ser.*, 119, 8-9

these chairs, the median was 4.3% with variations from 6.9% to 1.5%. Nearly all the schools in which the percentage was over 5 were giving more than 300 hours to paediatrics. A surprisingly large number of schools had no accurate records in this connexion. As a rule, paediatrics was included in the last year of the medical curriculum; there were only 12 schools in which the course was of two years' duration and in only one was it spread over three years.

Available teaching facilities

In the study of essential facilities for the teaching of paediatrics, attention was centred chiefly upon the number of hospital beds available, the quality of the facilities offered in the hospitals, and the libraries.

It was found, with respect to 73 paediatric chairs, that the proportion of beds available for practical work was generally adequate to provide sufficient clinical material even though distribution was extremely variable, ranging from 690 beds in one case to none at all in four—which meant that a total of 820 students apparently had no contact whatever with hospitalized children.

It is usually considered that the student of paediatrics should attend at least 10 patients during his practical course in the hospital, and double that number in the outpatient clinics. This is usually possible when there is an over-all ratio one of bed per student. About one-third of the chairs had fewer beds than this at their disposal, and one half had more than two beds per student. When there are too many patients to attend to, less time is spent on the actual teaching. The teacher is obliged to hurry over each case and this tends to confuse the student as well as setting him a bad example.

A sufficient number of beds reserved for communicable-disease cases was generally available for hospital practice, since in Latin America communicable diseases play a predominant role in morbidity and mortality. Nevertheless, of the schools disposing of hospital beds, 20 did not reserve any specifically for patients with communicable diseases. It is possible, of course, that the students did practical work on communicable diseases in other services.

In certain hospitals, the placing of children in the general wards for infectious cases resulted in neglect of the paediatric aspects of the disease process and of the special needs of the children as growing persons. It is important to group infectious cases by type of infection, and every precaution should be taken to prevent children with communicable diseases from transmitting them to others—without, of course, losing sight of the fact that communicable diseases are so common in childhood that every child is a potential source of infection.

It was found that the emotional problems of the hospitalized child require much more attention even though this aspect may be less immediately obvious than the diagnosis and treatment of organic disease. Children often find hospital life cold and impersonal compared with the warmth of family life; their emotional adaptation is an important element in their recovery and also helps the physicians and students who are taking care of them.

In many of the hospitals visited, the registers were kept in an unsatisfactory and incomplete manner, and the laboratory services were considered inadequate. The surgical and radiological installations, on the other hand, were as a rule quite satisfactory. The social services were particularly deficient and only in a very few hospitals was any real attempt made, in the teaching programme, to co-ordinate the medical work with any form of social investigation.

It was also noted that few centres were effectively applying modern rehydration and electrolyte therapy, with the result that students were not receiving sufficient instruction in this field. This is particularly unfortunate since in practically every part of Latin America there is a great deal of acute infant diarrhoea and malnutrition accompanied by dehydration and electrolyte disequilibrium.

Although the system of having mothers and newborn infants in the same room (" rooming-in ") is fairly general practice, teachers did not lay sufficient emphasis on the psychological implications. In fact,

there was a tendency to substitute for this praiseworthy traditional custom a system whereby newborn infants are installed in separate nurseries. In some cases there were no modern incubators or oxygen installations and in others, owing to lack of washbasins, aseptic precautions were neglected.

The library services—a most important element in paediatric training today—were unsatisfactory in most of the schools visited, although in a few they were excellent. Very few libraries were adequately provided with basic paediatric works for consultation by students, and works in Spanish and Portuguese were very scarce. There was an obvious need for competent librarians capable of organizing the basic reference works and fournals and keeping them up to date.

Paediatric faculties

It is not always an advantage for the professorship in a particular subject to be held by a leading specialist, because specialists are not necessarily good teachers and, moreover, are generally too busy to devote much time to teaching. The best way of ensuring high quality and continuity in the teaching of a subject is to have a group of professors devoting their whole time to the work.

One of the greatest handicaps to paediatric teaching in Latin America is that, in many schools, the subject is taught in the few hours the professors can snatch from their private practice. Their remuneration—when there is any—is very small, and they cannot be asked to make further sacrifices. If really good training is to be achieved, professors will have to be given adequate salaries.

The circumstances varied considerably from place to place but, as a rule, the professors devoted only a very small part of their time to teaching paediatrics. In order to establish a ratio between the number of hours and number of students, the total hours of all members of the teaching staff were divided by the number of students, and this gave a maximum of more than 274 hours and a minimum of less than 1 hour per student. The median for the 56 chairs supplying these data was 26 hours of classwork per student. This small time-allotment and the shortage of professors prepared to teach full-time are important obstacles to good paediatric training, for many of the teachers are excellent and have received modern training in paediatrics.

In most of the countries concerned, paediatrics is understood as covering all the medical aspects of childhood from birth to the end of adolescence, but in others there are somewhat confusing subdivisions. Some schools have one chair for puericulture and early infancy and another for clinical paediatrics, so that an arbitrary dividing-line is drawn between infants and older children. It is not advisable to separate puericulture from paediatrics as a whole, because the growth, development and care of the normal child are better understood when studied in relation to all other aspects of paediatrics.

The survey confirmed that research work is essential to good training but, unfortunately, few paediatric departments were undertaking such work—in most cases because they were without suitable equipment and full-time staff.

Other teaching activities

The study included a questionnaire on the methods employed for history-taking, physical examination and subsequent medical treatment. Analysis of the data obtained showed that a considerable percentage of the students had some experience in these fields. On the other hand, laboratory work —which is obviously invaluable in helping the student to obtain a clearer picture of the biological evolution of disease—was largely neglected.

In some departments and hospitals the groups of students were too large for satisfactory instruction: many of them confined themselves to observation; they were given theoretical explanations concerning diagnosis and treatment, instead of taking an active part, under close supervision, in the establishment of clinical histories, in physical examinations and in analyses—activities which

would develop their diagnostic powers and ability to decide on treatment.

Referring to the lecture method, the WHO Study Group on Paediatrics in its report expressed the view that "... the method is ideal for original presentation of certain aspects of basic paediatric material, for instance, growth and development, psychological problems, relation to public health indices. A well-planned lecture sets the stage for work with individual patients and helps to balance the student's education. On the other hand, the Group noted the danger of over-use of the lecture method as being the easiest way out when there are few teachers and large groups of students and the objective is merely complete coverage of textbook material. Another potential danger... is the passive and receptive role of the student. A premium may be placed on the ability merely to memorize facts." [5]

The paediatric curriculum in Latin America placed great emphasis on the diseases peculiar to infancy and on the symptoms of some general maladies. There should be some modernization here to bring teaching into line with the present-day concept of paediatrics as the branch of medicine dealing with all aspects of child health including growth and development, prevention, treatment, psychological and emotional factors affecting the child patient and his family, and the relationship of the child to his environment. Students should be made to understand that, above all, it is the process of development within the child—and not merely weight or size—that differentiates him

[5] *Wld Hlth Org. techn. Rep. Ser.*, **119**, 7

TABLE 2. NUMBER AND PERCENTAGE OF LATIN AMERICAN SCHOOLS OF MEDICINE* PROVIDING INDIVIDUAL TRAINING IN PRACTICAL ASPECTS OF PAEDIATRICS IN 1956

Activity	Number	Percentage
Interviews with parents	59	86.8
Case histories	64	94.1
Examination of patients	67	98.5
Laboratory work	28	42.4
Methods of treatment	64	94.1
Demonstrations (operations and special techniques)	55	82.1
Case observation	64	94.1

* The number of paediatric chairs giving specific data varied from 66 to 68.

TABLE 3. NUMBER AND PERCENTAGE OF PAEDIATRIC CHAIRS * IN LATIN AMERICA PROVIDING TRAINING IN SPECIALIZED BRANCHES OF PAEDIATRICS IN 1956

Branch	Lectures		Case observation		Practical work	
	number	%	number	%	number	%
Growth and development	64	92.8	52	80.0	40	60.6
Normal new-born infants	63	92.6	54	83.1	47	72.3
Infants and healthy children	64	92.8	49	76.6	42	64.6
Public health services for infants and healthy children	38	55.9	27	41.5	26	38.8
Premature infants	64	92.8	53	80.3	43	65.2
Handicapped children	34	53.1	31	50.0	22	34.9
Children with psychiatric and psychological problems	34	49.3	27	40.9	20	29.9
Communicable diseases	60	87.0	55	83.3	46	68.7

* The number of paediatric chairs giving specific information varied from 62 to 69.

from the adult. Paediatric education, if it is to be complete, must cover the newborn infant, the healthy child, public health services for children, and all the other activities mentioned in Tables 2 and 3; it must not be confined to theoretical instruction but should include case observation and practical work.

Quite a number of schools did, in fact, cover some of these aspects, but far too little attention was being paid to public health services for infants and children, or to services for crippled children and those with psychological and psychiatric problems. Only 25 chairs had child health centres available for teaching purposes, and in some cases no use was made of the abundance of excellent material available at these centres for the study of the growth, development and psychology of the healthy child, and of ways of dealing with family problems. There is no doubt that, because of its preventive value, the correlation of paediatric education with community health activities is of the highest importance.

Only five chairs made any attempt to use school health services, which are a rich source of material and permit almost continuous observation of cases, with the valuable collaboration of the teachers. It would be advisable for students to pay more visits to the homes of children attending the clinics; this would give them a closer insight into the social and environmental factors in children's diseases.

Very few chairs (26) made use of data provided by public health nurses or social workers—valuable auxiliaries who are both able to help in solving complicated diagnostic problems, and to facilitate treatment and subsequent observation.

Finally, the survey once again revealed the necessity for better instruction on all matters relating to the emotional and psychological aspects of childhood and family life; it also served to stimulate critical self-evaluation and efforts to achieve a real and lasting improvement in paediatric teaching in Latin America.

Reports of Expert Groups

FLUORIDES AND DENTAL HEALTH

The controlled fluoridation of drinking-water to prevent dental decay is today being carried out on a large scale. Twelve years after the first experiments in this field, more than 30 million people in the United States are using drinking-water to which fluorides have been added, while local fluoridation programmes are in operation in some 15 other countries.

The value and advisability of this health measure have been the subject of lively controversy. More than 3000 research publications have been devoted to fluoridation, and the contradictory nature of some of their conclusions must be a source of confusion to public health authorities. The publication by WHO of the report of the Expert Committee on Water Fluoridation,[1] which discusses the advantages, possible dangers and technical problems of the method, therefore fulfils an urgent need.

Controlled fluoridation

The keen interest aroused by this preventive method and the speed with which it has been adopted can be readily understood when it is remembered that dental caries is prevalent in all countries, in every walk of life, and

[1] WHO Expert Committee on Water Fluoridation (1958) *Report* (*Wld Hlth Org. techn. Rep. Ser.*, No. 146), 25 pages. Price: 1/9, $0.30, or Sw. fr. 1. Also published in French and Spanish.

at all ages, and that its treatment is a heavy burden on both public and private budgets. Loss of teeth and the resultant impairment of mastication may have serious repercussions on digestion and growth. Bad teeth are also a social handicap and, as such, can be the cause of psychological difficulties.

Despite recent advances in dental medicine, it is clear that the treatment of caries—always relatively expensive and often impracticable owing to a shortage of qualified personnel—can be no solution for the problem taken as a whole. The preventive measures so far advocated—dental hygiene, diet with supplementary vitamins, etc.—have generally not given the hoped-for results and are difficult to apply on a large scale. Thus, until the preventive effects of fluorides were discovered, public health authorities had practically no means of combating dental caries.

Although the empirical use of fluorides for the prevention of dental caries goes back nearly a century, our present knowledge of their biological effects is due to the work of McKay and Dean on the dental disease known as " mottled enamel ", for which a high concentration of natural fluorides in drinking-water was found to be responsible. Their research revealed incidentally that resistance to dental caries in communities where mottled enamel was endemic seemed to be very much above the average. This finding led to a new line of research, and investigation of the preventive action of fluorides in the field of dental health was immediately started in the United States.

There were many factors facilitating such investigation: the large number of communities living in areas where the water contained natural fluorides, the range of concentrations found in such areas, and the ease with which communities could be grouped according to their sources of water-supply. Careful examination of thousands of schoolchildren in some twenty American cities definitely showed that the prevalence of dental caries was, within certain limits, inversely proportional to the natural fluoride content of drinking-water. Similar surveys in a number of other countries subsequently corroborated these results, confirming the preventive action of fluorides and indicating that the optimal preventive concentration was about 1 part per million. Certain countries thereupon decided to take practical steps, and experiments in the controlled fluoridation of drinking-water were started in 1945 in the United States, at Grand Rapids (Michigan) and Newburgh (New York State), and then in Canada, at Brantford (Ontario). These pilot experiments were planned for a period of ten years so as to cover not only the primary dentition, but most of the permanent dentition, of a number of the younger children involved. The economic and technical aspects of controlled fluoridation were studied, as well as its prophylactic effects. The results of these experiments, compared with data from two groups of control areas, showed that fluorides added to water at the optimal concentration had exactly the same preventive action as those occurring naturally. The prevalence of dental caries among children who had been drinking the treated water since birth was 50% to 60% lower than in the control groups. Furthermore, very thorough paediatric examination both before and after the experiments showed that, at this concentration, controlled fluoridation had no toxic effects, even after a period of ten years.

Safety of water fluoridation

Although the ability of fluorides to prevent dental caries is no longer questioned, their safety is still widely doubted. The Expert Committee has endeavoured, in the light of the most recent information, to give an objective summing-up of this controversial question, which is dealt with in the second part of the report.

Fluorine, which is found in the form of natural compounds in almost every part of the globe, is also present in the skeleton and the teeth, as well as in a certain number of basic foodstuffs. It is essential for the body, particularly during growth, but it is known that very heavy doses can have certain toxic effects. Although fluorides appear to be

harmless in the optimal preventive concentration, it is essential to ensure that they have absolutely no harmful cumulative or long-term effects before authorizing the controlled fluoridation of an urban water-supply, since such a measure will lead to the continual daily ingestion of fluorides by a large population.

A thorough toxicological study of the fluorides has, in fact, been in progress for some time. Tests carried out on experimental animals have revealed certain forms of poisoning involving the bony structure and the kidneys in particular, but these morphological or functional changes occurred only after the administration of doses 50 to 200 times higher than the optimal preventive concentration. Furthermore, detailed studies of the ingestion and excretion of the fluorides and, above all, their metabolism—an essential factor in assessing toxicity—have failed to reveal any suspicious biochemical process. Finally, observations made in the United States in certain communities where drinking-water has a natural fluoride content considerably exceeding the preventive dose have shown that this high natural content has no harmful repercussions on public health and that growth, morbidity and mortality rates in the areas concerned differ in no way from the normal.

In conclusion, the Committee was of the opinion that the results of this extensive and thorough enquiry prove beyond doubt the safety of controlled fluoridation as a public health measure.

Practical aspects

After the value and safety of controlled fluoridation had been satisfactorily proved, it still remained to be seen whether it could be readily and economically put into practice. Experience over the last twelve years in waterworks already equipped for fluoridation shows that the process does not differ essentially from any other form of drinking-water treatment, such as chlorination, etc. It raises no new technological problem and the cost of the necessary installations is reasonable, even modest. In view of the toxic properties of fluorides, it is obvious that certain precautions should be taken. The mixing equipment should be planned in such a way as to exclude the danger of overdosage, and the fluoride content of the water treated should be carefully and regularly checked by qualified staff.

It is clear that the necessity for a well-equipped waterworks, as well as frequent and regular controls, limits the use of the method to well-organized water-supply systems, and that this will deprive very large population groups of its benefits. Other means considered for supplying the body with additional fluoride include the local application of fluorides to the dental enamel, the regular consumption of food with a high fluoride content, and, finally, the administration of fluoride tablets. Should these methods prove effective, they will be very useful in regions where the controlled fluoridation of drinking-water is not yet practicable.

NEW STANDARDS FOR ANTIBIOTICS, HORMONES, AND VACCINES

Information on a number of new biological standards and the corresponding international units is given in the eleventh report of the WHO Expert Committee on Biological Standardization, which has just been published.[1] In addition, the replacement of several standard preparations, of which supplies are insufficient, is discussed. The report also shows the special attention that is now being paid to the establishment of international standards for certain vaccines. The following points from it may be of interest to biologists and clinicians.

Antibiotics

The International Standard for *Tetracycline* has been established. It contains

[1] WHO Expert Committee on Biological Standardization (1958) *Eleventh report* (*Wld Hlth Org. techn. Rep. Ser.*, No. 147), 38 pages. Price: 1/9, $0.30, or Sw. fr. 1. Also published in French and Spanish.

990 units per mg, the unit being practically equivalent to one microgram of tetracycline hydrochloride.

The International Unit for *Erythromycin*, which has also just been established (0.001053 mg of the International Standard), is equivalent to one microgram of pure erythromycin base.

The International Unit for *Phenoxymethylpenicillin* has been defined as the activity contained in 0.00059 mg of the International Standard.

Preliminary studies of an assay method for *PAM* (procaine benzylpenicillin in oil with aluminium monostearate) have now been completed. Two batches producing fairly high concentrations of penicillin in circulating blood are available in sufficient quantity to serve as international reference preparations. In view of the importance of this drug, which is largely used in campaigns against treponematoses, a collaborative assay will be undertaken in man and in rabbits.

The collaborative assay of the proposed international standard for *neomycin* is in progress.

Antigens

The International Standard for *Pertussis Vaccine* has been established and the International Unit is defined as the activity contained in 1.5 mg of the International Standard. Owing to the inexactitude of current assay methods, great care should be taken in appraising the immunizing potency of a pertussis vaccine.

Work is continuing on the development of stable *typhoid vaccines* in sufficient quantities for future field trials,[2] for laboratory assays and for the subsequent establishment of an international standard for typhoid vaccine.

The prophylactic value of *cholera vaccine* is now generally recognized. There is still no evidence, however, that a vaccine which has given good results in the laboratory will be effective in practice. Concurrent field and laboratory studies will therefore have to be carried out in an endemic area on a fairly large scale, and the possibility of arranging for such studies is being examined.

The behaviour, in various assay methods, of different freeze-dried *smallpox vaccines*—including the proposed international reference preparation—will be the subject of a collaborative study. The Committee noted reports on the assay of the potency of smallpox vaccines by intracutaneous injection into rabbits, and on the use of tissue-culture methods to determine the virus content of such vaccines.

In several countries, efforts are being made to obtain a stable dried trivalent *poliomyelitis vaccine* which would serve as a reference preparation. It seems that certain preparations offer a satisfactory degree of stability. Collaborative stability studies will be organized by the Statens Seruminstitut, Copenhagen, in various laboratories. There is urgent need for a stable standard, since this would facilitate the development of improved methods of potency testing.

Antibodies

The albumin-potentiated anti-Rh_0 (anti-D) *blood typing serum* proposed as an international standard, is the subject of a collaborative study, on the completion of which the international unit will be defined. It has not yet been possible to obtain adequate quantities of agglutinating (" saline-agglutinating ") anti-Rh_0 (anti-D), anti-rh′ (anti-C) and anti-rh″ (anti-E) sera for use as international standards.

Lyophilized human, monkey, guinea-pig and horse *poliomyelitis sera* will be compared with the proposed international reference preparations in order to determine whether the latter are suitable for use in tests of the virus-neutralizing potency of sera from different animals. These indispensable reference sera are urgently needed for research purposes.

Steps have been taken to produce sufficient quantities of *yellow fever immune serum* for the establishment of an international reference preparation for mouse protection assays. It did not seem appropriate, however, to establish a reference preparation of non-immune (normal human) serum as was

[2] For details on preliminary field trials, see *Chron. Wld Hlth Org.*, 1956, 10, 153 and 1957, 11, 343.

suggested by the WHO Expert Committee on Yellow Fever Vaccine.[3] The Statens Serum-institut holds and will distribute this serum.

Hormones

Oxytocic, vasopressor, and antidiuretic substances. The International Unit of each substance is defined as the activity contained in 0.5 mg of the International Standard.

The attention of WHO has been drawn to the desirability of establishing international standards for *human menopausal gonadotrophin* and *relaxin*. The second standard for *prolactin* and the fourth standard for *insulin* are in course of preparation.

[3] *Wld Hlth Org. techn. Rep. Ser.*, 1957, 136, 9

The report also contains material on, *inter alia*, pyrogens, heparin, vitamin B_{12}, dextran sulfate, rabies vaccine, swine erysipelas vaccine, leptospirosis vaccines and sera, and cardiolipin.

The International Laboratories for Biological Standards at the Statens Serum-institut, Copenhagen, and at the National Institute for Medical Research, London, are custodians of all International Biological Standards and Reference Preparations, and distribute samples of these preparations, free of charge, to national laboratories for biological standards in all countries.

A list of these standards and preparations, with bibliographical references for each of them, is given as an annex to the report.

Notes and News

A step towards mass protection against malaria

With the disturbing realization that each year more and more of the mosquito carriers of malaria are developing resistance to the powerful insecticides that once destroyed them so effectively, the race to interrupt transmission in malarious areas before resistance sets in among the local insect vectors is increasing steadily in urgency. Moreover, unless transmission is maintained at a low level, there will always be a danger that the disease may become rampant again in areas where it has up to now been successfully controlled with insecticides.

One of the surest ways of interrupting transmission is to prevent the malaria parasite from developing in the human host, by treating the people at risk with an antimalarial drug. But while this is comparatively simple where individuals or specialized groups of people, such as schoolchildren or service personnel, are concerned, it is no easy matter where complete populations require protection. Quite apart from any economic considerations, the practical problems involved would rule out the large scale administration of a malaria suppressive in tablet form. A few years ago, however, it was suggested that if the suppressive could be added to some universal article of diet—salt, for instance—in the same way as iodine is incorporated in salt for the purpose of controlling endemic goitre, mass protection could be achieved without undue difficulty. This suggestion aroused immediate interest, and an investigation was undertaken to determine the efficacy of chloroquine- and pyrimethamine-medicated salt as a suppressive against sporozoite-induced vivax malaria (Chesson strain). The results of this investigation, which was carried out in the USA under an agreement between the Public Health Service of the US Department of Health, Education, and Welfare and the World Health Organization, have just been published in the WHO Bulletin.[1]

The first question to settle was the stability of the drugs under the conditions likely to be met with during storage and cooking. Once it had been established that both substances remained remarkably stable under these conditions, attention was turned to the

[1] Coatney, G. R., Mickelsen, O., Burgess, R. W., Young, M. D. & Pirkle, C. I. (1958) *Bull. Wld Hlth Org.*, 19, 53

important problem of determining the correct amount of drug to incorporate with the salt. Since the required amount must depend on the amount of salt consumed by the people to be treated, it was clearly necessary to ascertain the average daily salt consumption of the subjects to be used in the medicated-salt tests—volunteers of military age in the US Penitentiary at Atlanta, Ga. The investigators evolved a simple method for estimating the salt consumption, based on the daily urinary chloride excretion of the volunteers, and in the light of the result obtained decided on a dosage of 300 mg of chloroquine or 25 mg of pyrimethamine per 50 g of salt.

The next problem was to prepare uniform, stable drug-salt mixtures. This was not an easy task, but eventually satisfactory procedures for both drugs were worked out. The mixtures used in the tests were indistinguishable in taste and appearance from ordinary salt and were entirely acceptable to the volunteers.

The results of the tests are very encouraging. Malaria was completely suppressed throughout the medicated salt regimen (41 days for chloroquine, 45 days for pyrimethamine) and for 28-43 days thereafter in all the test subjects, even though they were exposed to three large doses of sporozoites (10 heavily infected mosquitos per man). In contrast, malaria parasites were demonstrable 13-15 days after exposure in the blood of the untreated control subjects, who were exposed to the same infective doses.

The tests outlined above were carried out on only a small scale (8 drug-treated subjects in each case and 4 or 5 controls), but the results lead one to hope that the method will prove to be of value in particular programmes aiming at malaria eradication.

Encephalomyelitis and poliomyelitis

The etiology of encephalomyelitis of the Mengo type is still obscure. The main reservoir of the viruses of this group, their geographical distribution, and the way in which they are transmitted are all unknown factors. It has yet to be established whether inter-human contagion with these viruses occurs, as in the case of the poliomyelitis, Coxsackie and ECHO viruses. Many epidemiological and clinical data suggest a close relationship between poliomyelitis and Mengo encephalomyelitis, and in fact the two complaints have often been confused. Nevertheless, certain findings—in particular, cytological changes in the infected tissues—differentiate the diseases from one another.

In a paper which recently appeared in the *Bulletin of the World Health Organization*,[1] G. Barski and F. Cornefert reviewed the results of a serological survey to determine the relationship between these two groups of viruses. For the purposes of this study, the distribution of the specific antibodies of Mengo encephalomyelitis was investigated among 362 Africans in the Belgian Congo (including 165 nomadic pygmies living near the area where the Mengo virus was isolated for the first time), 78 Europeans, and 83 Uruguayan children from Montevideo and neighbourhood. In a previous paper, the same authors, in collaboration with P. Lépine, described a search for poliomyelitis antibodies in the same sera.[2]

About 33% of the Africans (44% of the pygmies, often young children) were found to carry the Mengo-neutralizing antibody; so were 6 of the 78 Europeans—including one child—and 4 of the 83 Uruguayan children. The results led to the conclusion that a primitive mode of life and proximity to the tropical forest are factors favouring contamination with the Mengo virus.

Whatever the proportion of subjects carrying Mengo virus antibodies, it is always less than the proportion carrying poliomyelitis antibodies, which moreover increases with age, reaching 80-100% among adults over 20 years old. Among negroes in two isolated villages in the mountainous area, the proportion carrying poliomyelitis antibodies was 89%, 67% and 72%, respectively, for each of the three types, while only 18% carried Mengo virus antibodies. These facts strengthen the assumption that, even in the most favourable conditions, the Mengo virus

[1] Barski, G. & Cornefert, F. (1957) *Bull. Wld Hlth Org.*, **17**, 991

[2] Barski, G., Lépine, P. & Cornefert, F. (1956) *Bull. Wld Hlth Org.*, **14**, 119

(unlike the poliomyelitis virus) is not transmitted by inter-human faecal contamination.

The figures for town dwellers quoted in the paper confirm that Mengo encephalomyelitis may persist even in temperate regions and that the source of infection, unlike that of poliomyelitis, is extra-human. Rats or other species of forest rodents, in whose faeces and urine the Mengo virus is plentiful, are thought to be the vectors. The disease spreads more easily where dwellings are primitive and badly protected, as among the pygmies, who live in huts made of leaves.

DDT resistance in *Anopheles stephensi* in India

The emergence of strains of *Anopheles stephensi* resistant to DDT has now been reported from India as well as from the Eastern Mediterranean area.[1] A preliminary note published in 1956 [2] indicated that the larvae of *A. stephensi* (type form) were developing resistance to DDT in Erode town, Madras, and this has recently been confirmed by Dr B. A. Rao, Director of the Malaria Institute of India. DDT has been in use in Erode town as a larvicide in wells since 1947 and as a residual spray on wall surfaces of wells since July 1956. In November 1957, a team from the Malaria Institute carried out tests on the susceptibility of *A. stephensi* larvae and adults. The larvae were found to be about 1000 times as resistant to DDT as specimens which had not been exposed to the insecticide, whereas the adults were much less resistant (minimum lethal concentration of DDT 3.16%). A similar phenomenon has already been observed in *Aëdes aegypti*, and in both cases the development of resistance followed the prolonged use of DDT as a larvicide.

Indications of a diminished susceptibility to DDT in *A. stephensi* have also been reported from Mysore State.[3] In a series of susceptibility tests 27.8% survivors to 2% DDT were found. Although it is not stated which form of *A. stephensi* was tested, the fact that the work was done in the rural areas of Mysore suggests that it was the variety *Mysorensis*, a form commonly found in rural areas. It therefore seems likely that resistance is not restricted to the type form usually found in the towns.

Some experimental studies recently reported [4] suggest that in *A. stephensi* continued exposure to DDT results in " the selection of a factor or a number of factors, other than a specific gene for resistance, imparting an increased tolerance to the insecticide ". Such factors might be, for instance, a thicker cuticle, less permeable to the insecticide, or a larger fat body where the insecticide could be stored without reaching the nervous system. This is the phenomenon for which the term " vigour tolerance " has been suggested.

Yaws control in the face of tribal taboos

A nation-wide mass campaign against yaws was started by WHO in Liberia on 1 January 1955. Previously, Liberia was an area of high endemicity, with an infection rate of 24-48% in the Central Province and 6-11% in the Western Province. WHO policy is to recommend mass treatment whenever the prevalence of clinically active yaws in a community is over 10%.

In a total population estimated at 750 000, there are in Liberia 20 indigenous tribes, belonging to three distinct ethnological groups, as well as about 16 000 Americo-Liberians whose ancestors were freed slaves from the USA. As each tribe has its own beliefs, superstitions, and tribal laws, the problem of organizing a mass campaign and recruiting and training the necessary personnel was even more complex than usual. Dr E. G. H. Bendel, formerly Chief Medical Officer, World Health Organization, Liberia, describes the problem in the following words:

" One of the main difficulties of the yaws campaign in Liberia lay in the fact that the approach of the teams had to be altered according to the customs and beliefs of practically every province. For instance, it was

[1] *Chron. Wld Hlth Org.*, 1958, **12**, 94
[2] Rajagopalan, N., Vedamanikkam, J. C. & Ramoo, H. (1956) *Bull. nat. Soc. India Malar.*, **4**, 126
[3] Shama Sastry, H., Sitaraman, N. L. & Rama Rao, T. S. (1956) *Indian J. Malar.*, **10**, 349
[4] Davidson, G. (1958) *Bull. Wld Hlth Org.*, **18**, 579

soon discovered from hearsay as well as from experience that people in the western provinces are rather backward, superstitious and living under constant control of devils with whom they communicate by means of numerous secret societies. The most influential are the Poro bush society, the Water society and the Crocodile and Snake societies. Each one of them possesses its own particular rules and taboos strictly followed by its members and to which the slightest derogation would undoubtedly entail the death of the member involved. These local laws are kept strictly secret and we could hardly learn of them by means of carefully carried out investigations and gifts. We discovered, for instance, that it was forbidden to enter some of the villages with shoes. In others, it was not allowed to burn palm oil. In Gio country, people do not eat chicken, while in Bassa country where the Snake society has its followers, it is strictly forbidden to kill any kind of snakes. Before entering a town, our teams had to be necessarily aware of such rules and to follow them inasmuch as the slightest violation would have frustrated their work."

Despite these difficulties, the campaign was carried through successfully, and by 15 December 1956, when the resurvey was completed, the total prevalence of yaws cases had dropped from 60-70% to 1.5-3%, and the rate for infectious cases from 2-4% to 0.2-0.4%. The hyperkeratosis rate—the most important index of the success of the campaign—had fallen from 50-60% to 1.3%. During the campaign 701 661 people were seen and treated in three districts in Liberia. The attendance reached 95% of the population surveyed—the figure which had been set as a target at the outset of the campaign.

Local treatment of wounds to prevent rabies

Although it cannot take the place of prophylaxis, the local treatment of wounds caused by the bites of rabid animals can prevent or retard the penetration of the rabies virus, and is therefore a useful first aid measure.

Nitric acid and soap solutions have been used in this connexion for some time. More recently, the use of detergents (Zephiran chloride and Terjolate) and the infiltration of antirabies serum under the wound have been advocated. Experiments have been made with animals, in which wounds were produced artificially and infected with rabies virus by means of forceps. An initial study on the subject was published in the *Bulletin of the World Health Organization* in 1954.[1] The results of further experiments recently appeared in the same publication,[2] and may be summarized as follows.

Nitric acid applied within 4 hours gave protection in experimental animals, but was ineffective after 24 hours. These results confirm the findings of other workers.

Antirabies serum also proved effective both when infiltrated under the wound and when inoculated systematically up to 24 hours after infection, this being the longest interval tested. The results suggest that the serum exercises a specific local action. The detergent Terjolate when applied by gentle swabbing, or by infiltration of saline solution under the wound, up to 3 hours after infection, was distinctly less effective than nitric acid or serum. The excellent results obtained with Zephiran chloride point to the need for further studies on this and similar substances less corrosive than nitric acid.

The experiments confirmed the value of simple washing, flushing or irrigation of wounds as a means of reducing virus levels below the infective dose.

Nursing education in Pakistan

In 1952, a WHO/UNICEF-assisted nursing education project was started at the Medical College Hospital and School of Nursing, Dacca, East Pakistan. Its aim was to strengthen nursing in East Pakistan by providing more nurses; by training nurses as instructors and administrators; by revising the curriculum to meet the health needs of the people; and by advising the Government on all matters pertaining to nursing. Teaching and

[1] Shaughnessy, H. J. & Zichis, J. (1954) *Bull. Wld Hlth Org.*, **10**, 805

[2] Perez Gallardo, F., Zarzuelo, E. & Kaplan, M. M. (1957) *Bull. Wld Hlth Org.*, **17**, 963

hospital equipment were supplied by UNICEF, while WHO provided nurse educators and arranged for fellowships for advanced study for Pakistani nurses attached to the school. This project ended in December 1957.

While a certain time must elapse before the results of the Dacca project can be assessed, there already is no doubt that—despite shortage of staff and other difficulties—much has been achieved. A nucleus of qualified instructors and administrative staff was available, at the conclusion of the project, to take over the work of the school. The curriculum has been revised, and public health and its nursing aspects introduced into the pre-clinical courses. The teaching of paediatrics has been started, clinical practice areas for students have been organized and teaching facilities improved. The physical facilities of the hospital have also been much improved: sinks and bathrooms have been added, nurses' offices and duty rooms have been built, while work has started on a new nurses' hostel and an out-patient department. Finally, plans are being made for continued WHO assistance to the East Pakistan Government in the development of nursing education throughout the Province.

Training of fundamental education workers

From December 1954 to December 1957, WHO co-operated with the Government of Thailand and UNESCO in the training of health workers at the Thailand UNESCO Fundamental Education Centre (TUFEC), Ubol, Thailand. The purpose of TUFEC is to train teams for fundamental education work in villages in various parts of the country. Each team consists of six workers trained respectively in health, education, agriculture, social welfare, " home-making ", and village industries. The training course lasts for two years, and the first group of sixty students graduated from the school in March 1957.

The health programme of the school was developed by two WHO public health nurses in co-operation with Thai medical staff. Miss Maire Halonen, the first of these nurses, worked at TUFEC from December 1954 to April 1956; she was succeeded by Miss M. J. Heafey, who remained until the end of 1957 when her duties were taken over by a Thai public health nurse.

In the first year of training, a course of forty lectures is given to all students to explain the general health situation in Thailand, and to show how the particular tasks of each of the other workers on the team are linked with those of the health worker: for example, the agriculture and health workers are both concerned with hygienic composting. The training given to the students specializing in health work includes lectures, demonstrations and six months' field training. During the period of field training, the students live in the villages and, with the help of the villagers, undertake such tasks as the building of latrines, and the improvement of wells and sewage disposal facilities. They also hold home nursing, first aid and baby care classes.

Libyan training centre for health personnel

WHO assistance to a training programme for health personnel in Libya started in December 1955. Two WHO advisers—Dr A. G. E. El Hefny, public health administrator, and Mr M. El Hadidi Addo, sanitarian—first carried out a survey to decide the needs for trained personnel and the types of training required. Arrangements were then made for the building of a training centre for sanitarians and sanitary officers (medical assistants), which was completed by the end of 1956 and opened in March 1957 with a staff of five teachers and three doctors, all serving part-time. Students were selected from the three provinces of Libya—25 for the course for sanitary officers and 21 for the course for sanitarians. The centre is directed by Dr G. Farah, the new WHO senior adviser to the programme, who took up his duties in February of this year.

Leprosy control in Colombia

Under the terms of an agreement signed a few months ago between the Government of

Colombia and the World Health Organization, a survey is to be made in that country of the incidence of leprosy, the local characteristics of the disease, and the facilities available for its control. The survey's findings will be used in the planning of a long-term antileprosy campaign.

The preliminary survey and the subsequent campaign will be the direct responsibility of the Leprosy Section of the Colombia Public Health Department, and WHO—under the terms of the Expanded Programme of Technical Assistance—will give technical assistance and advice to the campaign directors and award fellowships for specialization in leprosy diagnosis, treatment and control.

Intramuscular injections

The precautions to be taken and the procedures to be followed when giving intramuscular injections are well known, but they are not always satisfactorily observed under conditions such as those met with in mass treatment campaigns against the treponematoses, nor is the importance of employing uniform techniques always sufficiently appreciated. In a paper shortly to be published in the Bulletin of WHO, Dr C. J. Hackett and Dr C. W. Göckel of the Venereal Diseases and Treponematoses Section, World Health Organization, present a brief review of the recommended techniques and procedures, covering all aspects of intramuscular injection from the choice and maintenance of equipment to the carrying-out of the actual injection.

Cholera epidemic in Thailand

At the request of the Government of Thailand, 500 000 ml of cholera vaccine have been sent to that country by WHO to help combat a cholera epidemic which had caused over 300 deaths by mid-June. More than 2000 cases have been reported in Bangkok and 17 provinces. This emergency shipment was authorized after consultation with members of the WHO Executive Board.

This is the first cholera epidemic in Thailand for several years; the last case reported there occurred in 1951, and there were 9 cases in 1949.

There are signs that the incidence of cholera in 1958 may be high: the number of cases so far reported is double that for 1957 in East Pakistan (8900 as against 4000) and India (17 600 as against 8400). The disease has also been reported in Cambodia (2 cases) and Burma (4 cases).

Death of Dr Emilie J. Deltombe

It was with deep regret that her colleagues in the World Health Organization learned of the death of Dr Emilie J. Deltombe, of Belgium. Dr Deltombe was killed in a road accident in Nigeria, where she took up her duties in January of this year as Maternal and Child Health Medical Officer at the Oji River Rural Health Demonstration and Training Centre.

A graduate of the University of Liège, Dr Deltombe was in 1952 awarded a WHO fellowship for study in the United States, where she obtained a Master's degree at the Harvard School of Public Health. Subsequently she worked for WHO as Maternal and Child Health Officer in Cambodia and in Calioub, Egypt. Just before her assignment to Nigeria, Dr Deltombe had prepared a plan of operations for a maternal and child health programme in Tunisia.

People and Places

Control of houseflies

WHO will shortly investigate reports from Liberia of an increase in the density of houseflies following the application of dieldrin in antimalaria operations. At the same time, the suitability of current fly control methods in Liberian conditions will be investigated, and a long-term programme for the control of houseflies established.

Dr Norman Gratz, of the United States, the entomologist in charge of these operations, will be assisted by Mr J. Skelly, a sanitarian from the United Kingdom. Dr Gratz has held the post of medical entomologist in the Division of Sanitation, Ministry of Health, Israel, for some years.

Nursing training in Afghanistan

The newly appointed senior nurse educator on the WHO nursing team in Afghanistan—Miss Pamela M. Smeeton, of the United Kingdom—will assist the Afghan Government in planning and carrying out improvements in nursing education. Miss Smeeton, who holds a Sister Tutor's diploma from the Royal College of Nursing, London, has been Assistant Matron of the London Hospital since July 1956.

The WHO nursing team in Afghanistan provides courses at a school for male nurses established in Kabul with assistance from the Organization, as well as courses for female nurses and midwives. The curricula lay special emphasis on training in public health work. Afghan nurses and midwives are gradually being prepared to continue the teaching programme when the WHO team leaves.

Conference on occupational health

A conference on occupational health in South-East Asia will be held in Calcutta from 24 November to 5 December 1958. It is being organized by the Indian Ministries of Labour and Public Health, with assistance from ILO and WHO, for the purpose of reviewing the present situation of occupational health in South-East Asia and planning a co-ordinated programme for the future. The following countries will be represented: Afghanistan, Burma, Ceylon, India, Indonesia and Thailand.

Dr Leo Noro, of Finland, recently went to India to help the WHO Regional Office for South-East Asia in its preparations for this conference. Dr Noro studied occupational health in the United States and was responsible for the organization of the Institute of Occupational Health in Helsinki. He was President of the XIIth International Conference of Occupational Health, held in Helsinki in July 1957, and has served on the Joint ILO/WHO Expert Committee on Occupational Health.

Rehabilitation work in Bombay

In 1952, WHO helped the Indian Government to establish an All-India School of Physiotherapy in Bombay. A rehabilitation centre, working in collaboration with this school and serving hospitals in Bombay State, was set up three years later with the assistance of the United Nations Technical Assistance Administration and the World Veterans Federation. Dr F. K. Safford, of the United States, recently went to India to advise the WHO Regional Office for South-East Asia on further assistance to this undertaking on the medical side.

Dr Safford, who has been Director of Physical Medicine and Rehabilitation in New York City Hospital for many years, has visited Austria, Greece, Spain and Yugoslavia, on behalf of WHO, to advise on rehabilitation work.

Health services and community development

As part of a community development plan covering the whole of India, WHO and UNICEF are assisting the Indian Government in fifteen States to develop preventive and curative health services and to train staff for rural health work. Dr Guillermo López de Nava was recently appointed Senior WHO Officer in the health project for community development areas in Bombay State. This project, which started off with maternal and child health activities in 1955, has now been expanded to include the establishment of health centres, the improvement of hospitals to which patients from these centres are referred, the establishment of laboratory diagnostic services, and the general strengthening of rural health services.

Dr López de Nava qualified in public health at the Mexico School of Public Health and Hygiene in 1939, subsequently working on the development of rural health services in Mexico and as an epidemiologist. During the past twelve years, he has served with the United Nations Relief and Rehabilitation Administration in Germany, and with the United Nations Korean Reconstruction Agency.

X-ray engineering in Taiwan

As WHO X-ray engineer in Taiwan, Mr R. Arthur Acham is making a survey of local X-ray facilities and training technicians in the installation and maintenance of mobile and static X-ray equipment. Mr Acham, who studied X-ray technology in England and the United States of America, has been Chief of the X-ray Engineering Services of Trinidad and Tobago since 1949.

Control of brucellosis

In connexion with a WHO seminar on brucellosis held in Africa in June, Dr Lois M. Jones, of the United States, has prepared a study on bacteriological and serological methods in brucellosis control, and an assessment of the results of recent vaccine trials in sheep and goats, sponsored by FAO and WHO.

A graduate of the University of Wisconsin, Dr Jones was until recently engaged in research at the WHO/FAO Brucellosis Centre, Weybridge, England.

Maternal and child health services in Viet Nam

Miss Elizabeth E. Barton, of the United Kingdom, has joined the staff of the WHO-assisted maternal and child project in Viet Nam as nurse educator. She will work with the Government to develop maternal and child health services, and will help to train local personnel. Miss Barton, who has been with WHO since 1953, comes to Viet Nam from a similar assignment in Pakistan.

Headquarters appointment

Dr Leonard Bruce-Chwatt has been appointed Chief of the Planning Section of the Division of Malaria Eradication recently established at WHO Headquarters.[1] A graduate of the University of Warsaw, Dr Bruce-Chwatt holds post-graduate degrees and diplomas from the State Institute of Hygiene, Warsaw, the University of Paris, the London School of Hygiene and Tropical Medicine, and the Harvard School of Public Health. He has had many years' experience of antimalaria work in Nigeria, where he organized the Malaria Service of the Nigerian Medical Department. Dr Bruce-Chwatt was appointed to the WHO Expert Advisory Panel on Malaria in 1951, and in 1956 served as a member of the WHO Expert Committee on Malaria. In 1957, he was a member of the Malaria Evaluation Team in India, sponsored by the US Government and the Rockefeller Foundation.

[1] See *Chron. Wld Hlth Org.*, 1958, **12**, 61.

Review of WHO Publications

Insecticide Resistance in Arthropods, by A. W. A. Brown, Geneva, 1958 (*World Health Organization : Monograph Series*, No. 38), 240 pages. Price: £1. 5s., $5.00, or Sw. fr. 15.—.

The resistance to insecticides developed by many arthropods which are vectors of diseases affecting man and animals has lately become a public health problem of considerable importance, and consequently of interest to the World Health Organization. WHO has just issued a monograph on this subject in which the author, Dr A. W. A. Brown, Ph.D., Biologist, Division of Environmental Sanitation, WHO, has drawn on all the sources available over the past decade, comprising some 625 publications and much unpublished information, to give an exhaustive account of this phenomenon.

The appearance, history and geographical distribution of resistance is fully described and evaluated for each of the 40-odd species considered; in a very few instances the claims for developed resistance are shown to be unfounded. The genetical origins and physiological mechanisms of resistance are treated fully in the light of all available research findings. In nearly all cases resistance appears to be developed by Darwinian selection of insects carrying the pre-adaptations (genes), so that they become characteristic of the majority of the population surviving the insecticide treatments. There is little or no evidence for post-adaptation—for example, " habituation ". The physiological mechanism in resistance to DDT is mainly due to an increased ability to detoxify the insecticide, while the mechanisms of resistance to BHC, dieldrin and organophosphorus compounds are evidently more complex.

Resistance to DDT, on the one hand, and to BHC and dieldrin, on the other, have been shown to be two separate entities. Thus, in many cases dieldrin or BHC can be used to control DDT-resistant *Anopheles* mosquitos, and *vice versa*. Compounds have been discovered that are more toxic to DDT-resistant than to normal houseflies, and thus may be expected to result in the development of

DDT-susceptible strains from DDT-resistant ones. By the use of standard test methods, resistance can now be detected in the field as soon as it appears, so that appropriate action may be taken without delay.

By elucidating the process whereby resistant strains are developed, and distinguishing between different types of resistance, research workers have indicated the lines along which it can be counteracted; WHO has been entrusted with the role of co-ordinating the information already gained, and stimulating and augmenting further work on this urgent problem.

Excreta Disposal for Rural Areas and Small Communities, by E. G. Wagner and J. N. Lanoix, Geneva, 1958 (*World Health Organization: Monograph Series*, No. 39), 188 pages. Price: £1.5s., $5.00, or Sw. fr. 15.—. French and Spanish editions in preparation.

Waste matter, of whatever origin, has always constituted a real or potential source of danger to the health of man, although he long remained unsuspecting of the importance of treating wastes so as to render them innocuous. The risks inherent in radio-active wastes have recently caught the popular imagination and have caused great concern to many, but there is also a far older, though less spectacular, problem which is nevertheless of prime importance—that of safely disposing of human and animal excreta, which have been responsible for untold disease over the ages. Although such wastes are sometimes satisfactorily disposed of in urban areas, they continue to be a menace in many rural areas the world over.

This new WHO monograph is designed as a practical handbook for use in tackling this problem. It attempts to deal comprehensively with a subject which has generally been covered only in part, to provide specific technical information on suitable types of sanitary installation for rural areas and small communities and, at the same time, to give due consideration to the social and psychological factors involved in changing personal habits and in winning public support for efforts to improve excreta disposal practices. It begins with a discussion of the public health importance of excreta disposal, pointing out that in large areas of the world, and indeed in parts of every country, proper excreta disposal is among the most pressing health problems, and that the solution of this problem brings economic and social benefits as well as improved health. It then turns to the matters of participation and responsibility in programmes for constructing sanitary facilities in rural areas and for educating the people in their proper use.

There is a major technical section dealing with the privy method of excreta disposal, which is the method of choice in many of the rural areas of the world simply because the cost of water-carried methods often makes them economically impossible. Attention is given to factors which influence privy design, and some of the basic considerations in excreta disposal are dealt with, among them decomposition of excreta; quantities of human faeces; soil and ground-water pollution; the location of excreta disposal facilities; and engineering, human and cost factors. This is followed by a brief discussion of the criteria for selecting a particular method of excreta disposal and a general description of the more common systems, which are subsequently analysed in detail. Considerable space is devoted to the pit privy and the aqua privy, the most universally practical and acceptable installations. Other, less desirable types of privy described are the water-seal latrine slab, the bored-hole latrine, and the bucket latrine, the *feuillée* or trench latrine, and the overhung latrine. Also described are systems acceptable only in special circumstances—the compost privy, a means of conserving most of the fertilizing value of excreta with a minimum of health risks; and the chemical toilet, an installation too expensive for use in most rural areas of the world.

There is also an informative section on water-carried methods of excreta disposal for rural areas, institutions and small communities, in which septic tanks and the disposal of their effluent are discussed in detail. Among the subjects covered are prob-

lems in the disposal of water-borne wastes, the biological processes involved in the septic-tank procedure, the design of the septic-tank system, and effluent disposal methods, including subsurface irrigation, sand-filter trenches, sand filters, and trickis ling filters.

The last part of the monograph considers excreta disposal as a public health programme, outlining the steps in planning such a programme and describing the training and functions of the sanitation staff which is to carry it out.

This profusely illustrated study provides enough technical detail to be of assistance to those who are beginning their work in excreta disposal programmes in rural areas and, at the same time, offers some new ideas and approaches which may be of value to those with experience in trying to solve this very old problem. The text has been reviewed by a considerable number of experts from many countries, and their criticisms and suggestions have helped to make it a practical guide for public health administrators, medical officers of health, engineers engaged in health work, and sanitarians.

Bulletin of the World Health Organization, 1958, Volume 18, Number 4 (pages 481-684).

This recent issue of the WHO Bulletin is devoted mainly to papers on various aspects of insecticide resistance. The mechanisms of resistance in *Anopheles gambiae*, *A. sundaicus* and *A. stephensi* are discussed in a study by G. Davidson based on the observation of laboratory colonies and material caught in the field. Two distinct types of resistance were observed: (*a*) DDT-resistance with cross-resistance to analogous substances, but not to cyclodiene compounds nor to gamma-BHC; (*b*) dieldrin-resistance with cross-resistance to the other cyclodiene compounds and to gamma-BHC, but not to DDT. It was found that a general increase in tolerance to both groups of insecticides, and to other insecticides of entirely different groups, may be produced by prolonged exposures of apparently homogeneous strains to any of the insecticides.

S. Y. Liu summarizes recent laboratory tests to discover whether resistance to DDT and BHC had developed among certain insects in Taiwan as a result of insect control campaigns which had been in operation since 1948.[1] A similar investigation in French Guiana, where spraying campaigns have been carried out since 1949, is described by H. Floch and P. Fauran, who found that the *Culex fatigans* population at Cayenne had become resistant to BHC and dieldrin, tolerating 20 times the normal concentrations, while the *Anopheles asqualis* population has retained a very satisfactory susceptibility to DDT, BHC and dieldrin.

J. R. Busvine and W. Z. Coker contribute a paper on resistance patterns in DDT-resistant *Aëdes aegypti*, while R. H. Wharton reports the finding of two further dieldrin-BHC resistant strains of *Culex pipiens fatigans* in Malaya.[2] Notes are included on insecticide resistance in houseflies (K. R. S. Ascher), in body lice (J. McLintock, A. Zeini & B. Djanbaksh), in a Malayan strain of *Culex pipiens fatigans* (Marshall Laird), and in a strain of the same species found in Penang (R. H. Wharton).

In addition to the papers on insecticide resistance, this issue of the Bulletin contains the second part of the report by T. P. Pesigan and co-workers on the WHO-assisted pilot project for the control of bilharziasis japonica in the Philippines. This part of the report deals with the biology of *Oncomelania quadrasi*, the molluscan host of bilharziasis in the Philippines, and its relationship with *Schistosoma japonicum*.

The list of contents will be found in the advertising section at the end of this number of the Chronicle.

[1] A summary of this paper appeared in *Chron. Wld Hlth Org.*, 1958, 12, 24.

[2] A summary of this paper appeared in *Chron. Wld Hlth Org.*, 1958, 12, 94.

CORRIGENDA

Vol. 12, No. 5

POLIOMYELITIS AND PUBLIC HEALTH

Page 148, right-hand column, paragraph headed **Provocation of poliomyelitis,** line 2

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VENEREAL-DISEASE CONTROL IN THE WESTERN PACIFIC

Page 153, footnote

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REVIEW OF WHO PUBLICATIONS

Page 175, right-hand column, line 14

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BULLETIN

DE L'ORGANISATION MONDIALE DE LA SANTÉ

OF THE WORLD HEALTH ORGANIZATION

Studies on *Schistosoma japonicum* infection in the Philippines: 2. The molluscan host—*T. P. Pesigan, N. G. Hairston, J. J. Jáuregui, E. G. García, A. T. Santos, B. C. Santos & A. A. Besa*

Studies in insecticide resistance in anopheline mosquitos—*G. Davidson*

A summary of recent insecticidal tests on some insects of medical importance in Taiwan—*S. Y. Liu*

Resistance patterns in DDT-resistant *Aëdes aegypti*—*J. R. Busvine & W. Z. Coker*

Dieldrin-resistance in *Culex pipiens fatigans* in Malaya—*R. H. Wharton*

Sensibilité aux insecticides chlorés des larves de *Culex fatigans* et d'*Anopheles aquasalis* en Guyane Française—*H. Floch & P. Fauran*

Notes

Preferential knockdown action of cetyl bromoacetate for certain laboratory-reared resistant strains of houseflies—*K. R. S. Ascher*

Development of insecticide resistance in body lice in villages of north-eastern Iran—*J. McLintock, A. Zeini & B. Djanbakhsh*

Susceptibility of adults of a Malayan strain of *Culex pipiens fatigans* Wiedemann to DDT and dieldrin—*Marshall Laird*

Penang BHC-resistant strain of *Culex pipiens fatigans*—*R. H. Wharton*

Vol. 18, No. 4 (1958), 204 pages **10/- $2.00 Fr. s. 6.—**